IRON TRADE REVIEW
AND WESTERN MACHINIST

A JOURNAL OF MANUFACTURES, COMMERCE, INDUSTRY, SCIENCE, ART AND INVENTION.

WEEKLY EDITION VOL. XVII—No. 13 | CLEVELAND, O., MARCH 29, 1884. | MONTHLY EDITION VOL. II—No. 5.

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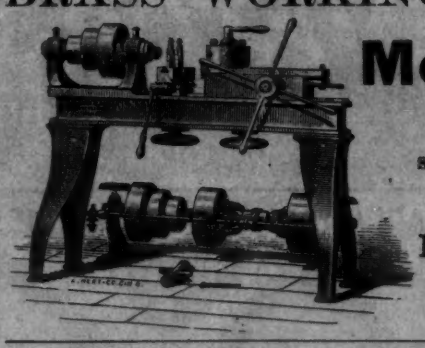

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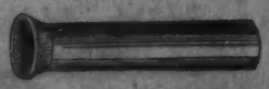

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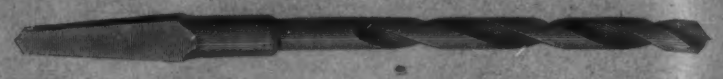

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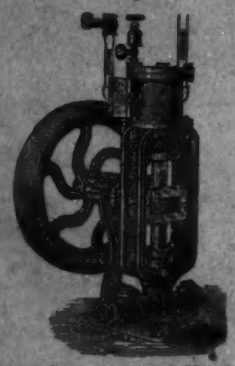

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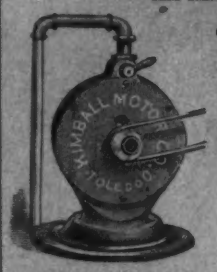

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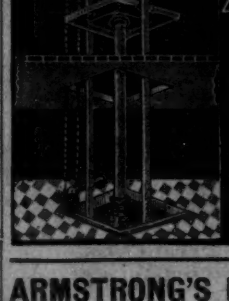

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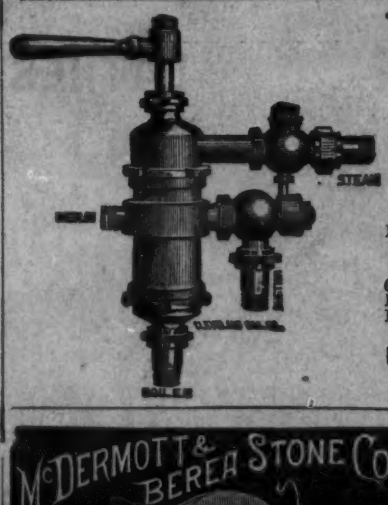

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IRON TRADE REVIEW
AND WESTERN MACHINIST

WEEKLY EDITION, Vol. XVII—No. 13. | CLEVELAND, O., MARCH 29, 1884. | MONTHLY EDITION Vol. II.—No. 3.

The Engine Room.

The Poole & Hunt Water-Tube Boiler.

This boiler is composed of lap-welded wrought-iron tubes, placed in an inclined position, and connected by vertical passages at each end with a horizontal steam and water drum. The tubes are "staggered," or so placed that one row comes over the spaces of the previous row. The vertical passages or end-connections are made of two plates of the best flange-iron or steel, placed far enough apart to give full area for the circulation between the inclined tubes and horizontal drum. The plates are flanged at sides and bottom, and very strongly stay-bolted together. The tubes are expanded into the inner plate, and suitable hand-holes in the outer plate admit the tubes and allow for cleaning. The connection to the drum is made in the strongest manner, and when subjected to a hydrostatic pressure of three hundred pounds shows no signs of weakness. The fire is made under the higher end of the tubes, and the products of combustion pass up between the tubes into a combustion chamber under the steam and water drum; from thence they pass down across the tubes, thence once more up through the spaces between the tubes, and off to the chimney.

The water, being inside the tubes, as it is heated tends to rise toward the higher end, and as it is converted into steam—the mingled column of steam and water being of less specific gravity than the solid water at the back end of the boiler—rises through the front end-connection into the drum above the tubes, where the steam separates from the water, and the latter flows back to the rear and down again through the tubes in a continuous circulation. As the end-connections are large (the full area of the tubes being maintained), this circulation is very rapid and produces three very important advantages:

1. It sweeps away each particle of steam as fast as formed, and supplies its place with a particle of water, thereby absorbing the heat of the fire to the best advantage; and thoroughly separating from the water, in the large disengaging surface in the steam and water drum, prevents what is known as "priming" or "foaming," the steam passing away from the boiler dry, even when the boiler is forced to its utmost capacity.

2. It causes a thorough commingling of the water throughout the boiler, and a consequent equable temperature, thus preventing those very serious strains from unequal expansion which occur in all boilers of ordinary construction, and which are a frequent cause of explosions.

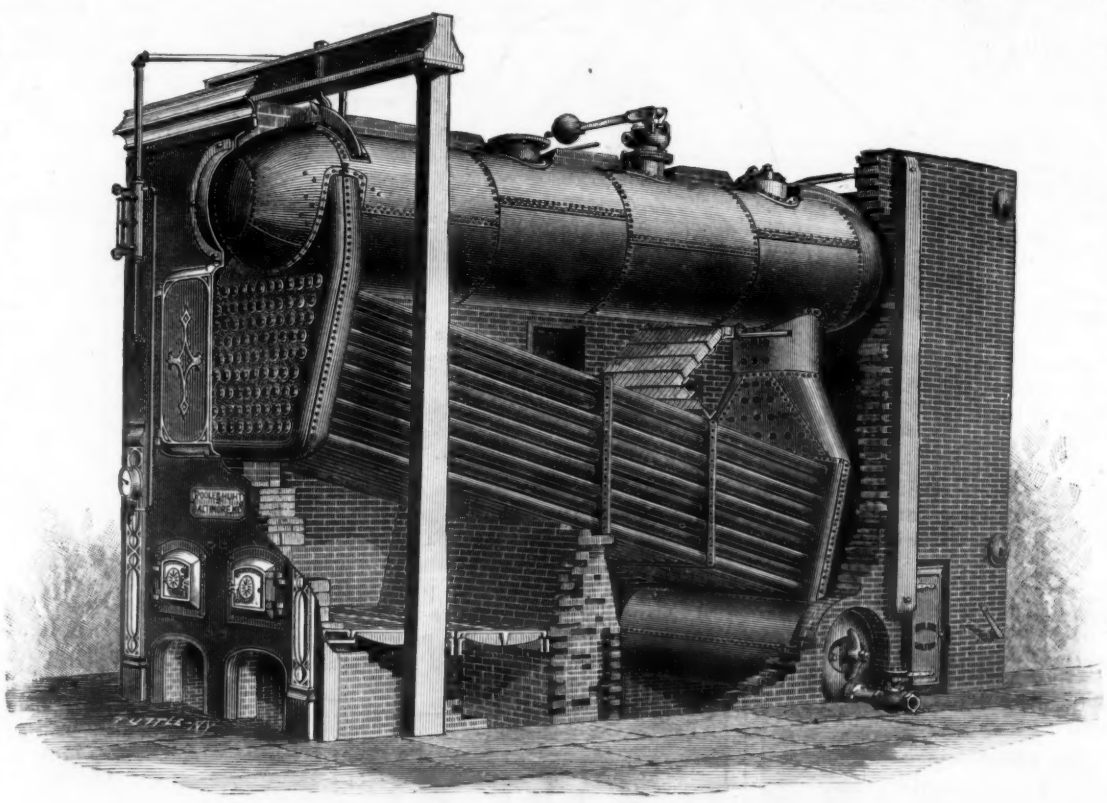
3. The rapid circulation prevents to a great degree the formation of deposits or incrustations upon the heating surfaces, sweeping them away and depositing them in the mud drum at the rear and lowest point of the boiler, whence they are blown out.

A hand-hole at the end of each tube permits access thereto for cleaning, should they become scaled by the use of very bad water, and man-holes in the steam and mud drums admit access to them for the same purpose. Should it be necessary for any cause, a tube may be readily removed and another substituted. The front end of boiler is suspended from a girder supported by columns entirely independent of the brick-work, and all the mountings, including gauges, safety valve, etc., are of the very best and most approved patterns.

It is now fully established, by the experience of boiler insurance associations in this country and England, that all the mystery of boiler explosions consists in a want of sufficient strength to withstand the pressure. This lack of strength may be inherent in the original construction, but is most commonly the effect of weakening of the iron by strains due to unequal expansion, caused by unequal heating of different portions of the boiler, or it may be due to corrosion from long use or improper setting.

This boiler, being composed of wrought-iron tubes, with drums and connections made of the best wrought-iron or steel plates, has a great excess of strength over any pressure which it is desirable to use, and as the rapid circulation of water insures equable temperatures in all parts the strains due to unequal expansion cannot occur to deteriorate its strength. Should one of the tubes give out—which is not at all probable—no explosion could occur; and in the case water be allowed to get so low as to overheat the shell and cause it to give out, what water remained would be confined to the tubes, and could not cause a destructive explosion like the single large body of water in the ordinary forms of boilers.

The makers claim that "experience with several thousand horse-power of these boilers in operation for a period of twelve years demonstrates their superiority and for parties who wish to carry high steam-pressure (100 to 125 pounds), we can confidently recommend this boiler as the most durable made." For further particulars and prices, address the manufacturers, Messrs. Poole & Hunt, Baltimore, Md.



THE POOLE AND HUNT WATER-TUBE BOILER.

Weighting Moulds.

London Engineer.

Moulders have many different ways of calculating the pressure and lift against the top parts of their mould, and have different factors of safety, yet the most modern books on moulding either ignore the fact or say nothing about it beyond that it is more a matter of judgment on the moulder's part than a calculation by figures. Will you give the rules that are used for such, and a short example of what experiences teaches to be the most reliable in practice? A.—Moulders, as a rule, judge by rule-of-thumb as to the weighting of their moulds, but they have generally a sufficient weight placed upon them, and for large boxes use pins and cotters as well as weights to secure the boxes together. It is very simple to calculate the pressure that will come against the top box if we know the area of the molten metal that will press against it; as, for instance, suppose the area of the casting be four square feet where it presses against the sand in the box top, then, if the runner, gate or "git" be the highest point to which it rises above the metal area in the top box, there will be a pressure against that area of about 40lb. on the square foot for every inch the surface of the top of the runner "git" is above the surface of the casting in the top box, and if that surface be 8 inch above the surface of the casting in the top box, then we have 4×40×8=1,280lb. weight, which would just balance the pressure. But two or three times this calculated weight should be placed upon the box before running in the metal. If there are a number of castings in one box take the area of the whole—that is, the sum of all the areas—as the area of surface pressing against the top box, and you may easily calculate the required weight.

Theory vs. Practice.

A useful man to Stonewall Jackson was old Miles, the Virginia bridge builder. The bridges were swept away so often by floods, or burned by the enemy, that Miles was as necessary to the Confederate army as Jackson himself. One day the Union troops had retreated and burned a bridge across the Shenadoah. Jackson, determined to follow them, summoned Miles.

"You must put all your men on that bridge," said he; "they must work all night, and the bridge must be completed by daylight. My engineer shall furnish you with the plan, and you can go right ahead."

Early next morning Jackson, in a very doubtful frame of mind, met the old bridge builder.

"Well," said the General, "did the engineer give you the plan for the bridge?"

"General," returned Miles slowly, "the bridge is done. I don't know whether the pictur is or not."

THERE are two little machines at Danbury, Conn., which cut the threads on screws one-eighth of an inch long, and of which it takes 200 to weigh an ounce. They have been working about a month, and each machine makes 5,000 screws a day.

Hints from Practical Men.

A Machine for Cooling Glue in Oil Barrels.

TO THE EDITOR:

Pull the handle, H, down until the spreader, J, is inside of the barrel through the bung; at the same time the handle, H, strikes the tappet, A, which engages with a rod connected to the lever, L, of the air-valve, C, and opens the air valve, letting in a supply of air (which is under 50 or 100 lbs. pressure in a tank not shown) which forces the gasoline by the syphon, B, through pipes. E K, and rubber hose F, into pipe I, through spreader to barrel and the air combined with the gasoline makes the cooling mixture or gas. This machine is patented by Messrs. Somers & Eager of this city.

EXPLANATION OF DIAGRAMS.

A—Adjustible tappet. B—Syphon. C—Air valve. D—Pipe leading to reservoir of compressed air. E—Pipe leading from syphon to gasoline. F—Rubber hose. H—Lever for working machine. I—Movable pipe connected with spreader. J—Spreader. K—Pipe connected to hose from syphon. L—Lever on air valve. M—Valve for regulating the flow of gasoline.

ENGINEER.

CLEVELAND, March 21, 1884.

Draughting Bevel Gearing.

TO THE EDITOR:

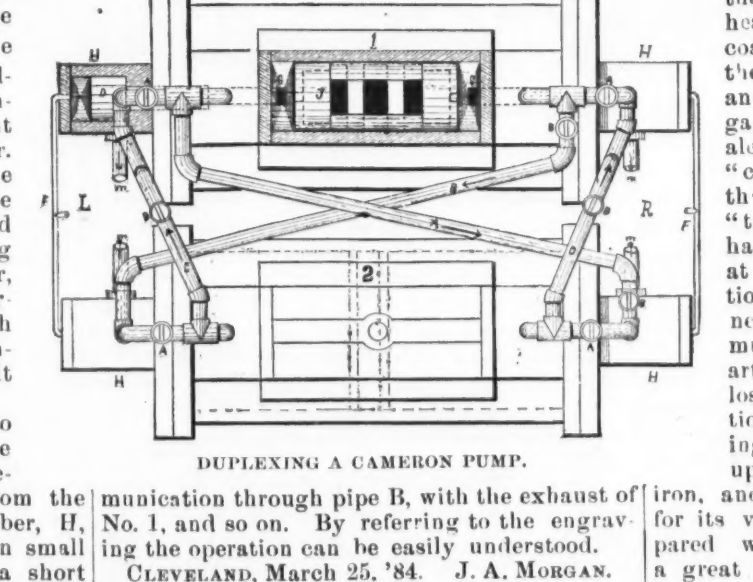
Will you so favor me as to give me some instruction on draughting bevel gearing. As I am learning the machinist's trade and am studying draughting, by your aid I could get clearer ideas.

E. J. HAMMERLE.

MARION, O., March 20, 1884.

The subject is a large one and our correspondent can find full treatment of the subject in almost any text book, but the following rule for laying out bevel gears of any diameter or angle, as used in actual practice, may be of assistance:

First draw lines A×A′ as center lines of shafts in their angles, then draw lines EE×FF parallel with the shafts, equal to the diameter of the gears, and where the lines EF intersect at P draw the lines DD′ equal to the diameter of each gear. These lines DD′ are the diametrical pitch lines; then draw lines C×C′ which equals half the angle between the lines D×D′ and C_e is the common center for the root and face of teeth. The line B is drawn at right angles with E to get angle of end of teeth. The teeth are proportioned the same as in spur gearing. We will present a diagram for draughting ordinary bevel gears, in a future issue.



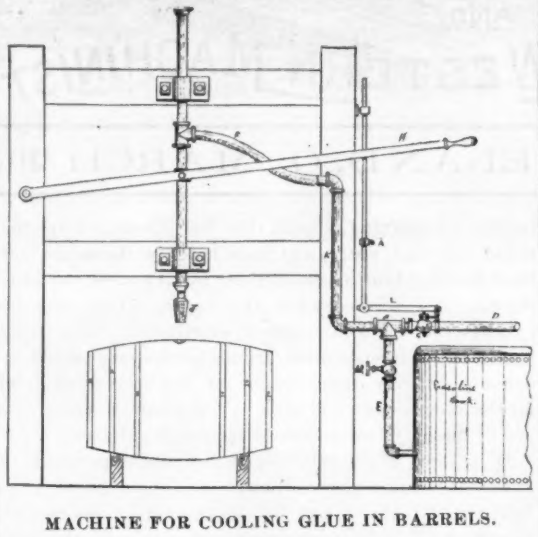
DRAUGATING BEVEL GEARING.

Duplexing a Cameron Pump.

TO THE EDITOR:

When the Standard Oil Co. moved their pump-house they had two Cameron pumps of the same capacity, which they were going to set up in the new pump-house if they could be duplexed. They accordingly wrote to the makers of the Cameron pump to have them duplexed, but they said it could not be done. Mr. Powell, the engineer in charge of the pumps, said, however, that it could be done, so he went to work on them and at last accomplished the feat of making one pump run the valves of the other, and they work satisfactorily. By referring to the accompanying sketch, which I have drawn only to show the pipe connections, you will see very easily how it was done.

To comprehend this, one will have to understand the valve motion of the Cameron pump, which I will not describe here. The exhaust, C, port from the supplemental piston to tappet chamber, H, was not cast all the way to it, as in small pumps of this make, but was cast a short distance and then communication with the port, C, and tappet chamber, H, was made by pipes. So Mr. Powell put in cocks, A, to shut off the exhaust, C, from the tappet of the pump it belonged to, and made a connection from the tappet of one pump to the exhaust port of the other, so that one pump instead of liberating its own exhaust of the supplemental piston, J, liberated the other, thus one piston began its stroke as soon as the other stopped. AAAA are cocks which remain closed when the pumps run duplex, and by opening cocks AAAA and closing cocks BBBB



MACHINE FOR COOLING GLUE IN BARRELS.

they can be run independent of each other. EEEE are exhaust pipes from the tappet chamber. FF are live steam pipes to keep a pressure on the backs of the tappets D. HHHH are tappet chambers. C is port leading from supplemental piston to exhaust the steam from it. A B C D are the pipe connections from tappet to the exhaust port.

The operation is as follows: The piston of No. 1 travels to the right, strikes the tappet and makes communication through pipe D to the exhaust of No. 2, which changes the valve in No. 2 to the right and starts the piston to the left until it strikes the tappet and makes communication through pipe B, with the exhaust of No. 1, and so on. By referring to the engraving the operation can be easily understood.

DUPLEXING A CAMERON PUMP.

CLEVELAND, March 25, '84. J. A. MORGAN.

The Electrical Theory of Boiler Explosions—No. 2.

TO THE EDITOR:

In my last article, I endeavored to lay the foundation of a theory, that all boiler explosions are the result of the decomposition of water by heat—the reaction or explosion of the gases being produced by electro-magnetism. The reader having some knowledge of the philosophy of electrolysis, or the decomposition and explosion of water by electricity, will readily understand the drift of this theory. In order to be understood by the average engineer and boiler owner, a few definitions may not be deemed improper. "Force" is a widely diffused effect of an unknown cause. To us, it manifests itself as a primary cause, the effect of which is "motion." Heat, light, electricity, and all physical energies are subject to this mysterious cause. Science has never been able to make a distinguishment between light and heat, other than that of degree and quality. As we are dealing with phenomena, it will be seen that this difference in degree and quality of heat will serve our purpose further on.

Heat has the power to destroy chemical affinities and reproduce them. It converts fluids and solids into gases, and gases into liquids and solids. This law of action and reaction, discovered by Newton, and utilized by him in his dynamical calculations, has since been discovered to hold good in all physical science; and it is to this discovery that modern chemistry and physical science in all its varied branches owe their wonderful progress.

We have seen that water decomposed by heat becomes combustible and will burn, provided the quality and degree of heat necessary to its combustion are applied. It is known that heat produces electricity, and that electricity produces heat of a different quality than the heat which produced the electricity. The former is called "thermo-electricity," the latter "electrical heat." The first is an effect produced by "radiating heat," the latter an effect produced by "conductive heat." The first is the product of chemical combustion—the latter, the product of mechanical force. It is claimed, however, by our best scientists, that "in all probability the former is only a variety of the immensely different forms of heat in which the latter is manifested." But this does not affect the fact of difference in quality and power which can be exemplified in a simple manner by submitting a carbon candle to the heat of a forge strong enough to melt iron. It will be found that the carbon will not melt nor burn, because the quality of heat is incapable of producing its combustion. But submitted to the voltaic arc, carbon is immediately brought to a state of combustion, emitting "electric light," wonderful as sunlight itself.

This brings us to what I shall term the geneological order and classification of heat, resulting in the explosion of steam boilers. The coals in the fire-bed give out radiant heat, so that the iron composing the boiler is heated by radiations from the fire of the coals. The iron, being conductive, heats the water in the boiler, decomposes it, and converts it into steam or water in its gaseous form. Hence the gaseous equivalents of the water are the product of "conductive heat," the same in quality that is required for the production of "thermo electricity." Now, since we have the required quality, it is logical, at least, to suppose that if the conditions can be supplied to furnish the necessary degree of heat, explosions must inevitably result. In my former article it is stated that in heating iron it loses its magnetism in just the proportion that carbonic acid is emitted, it being taken up by the latter and utilized up to the point of combustion of the iron, and that this is the probable reason for its very limited diffusive power as compared with hydrogen, for which it has a great affinity. Be this as it may, it is known that "hydrogen and oxygen do not combine spontaneously, but require the pressure of a red hot solid, or flame, or spongy

platinum." This is exemplified in a simple way by "Isaac Newton's" explosion of water on an anvil with a bar of red hot iron. The iron emitting red hot oxygen furnishes the "support" necessary to combustion, hence—explosion.

With these facts well considered, it seems clear that, with the water low in a boiler, the flues red hot and emitting oxygen, and surrounded with a dense body of uncombined hydrogen and oxygen, nothing short of a miracle could save it from explosion. We have all the material of thermo-electricity, even to the red hot solid or red hot oxygen ready to burst into flame.

But let us apply this theory to another case: Suppose that scale has formed on shell and flues; so long as the scale is firmly attached to the iron, the conduction of heat goes on perfectly, and no explosion can occur. But suppose that at the bottom of the shell the scale becomes detached from the iron over an area of three inches square, more or less (a separation due to the sudden expansion of the iron in that particular spot), thus forming a vacuum and arresting the conduction of heat to the water? Is it not morally certain that we have all the elements adjusted for an explosion? Under the scale we have not only a red hot solid, but a vacuum filled with red hot oxygen, all in the immediate vicinity of the rapid decomposition of the water by conductive heat. The scale suddenly cracks; the gases thus thrown into the immediate presence of a red hot solid combine; a thermo electric flash is produced in volume sufficient, perhaps, to decompose and explode all the water in the boiler, even if full.

If this theory be true, we have the key to very many of our unaccountable and terrific explosions. That the same results will follow corrosion or a separation of the oxide from the iron, leaving a crust of carbonate of iron, is so plain that it is only necessary to mention it. In case of a new boiler supplied with the purest of soft water, and having a careful attendant, it always answers to full gauges. But, suppose that on the inside of the boiler, immediately over the fire there is an almost imperceptible blister, or a spot not larger than the palm of a man's hand, where the iron in rolling failed to weld, leaving a vacuum under a scale of iron not thicker than a sheet of paper (these blisters are often seen on iron). The iron expands; the blister bursts; the gases combine with a thermo-electric flash, and a first-class explosion is the result. Your expert boiler inspector is on hand, and aping the wisdom of a professional, informs the coroner's jury and the gaping multitude that "they let the water run down."

Another case: The boiler is new, every plate perfect, every rivet sound and strong, and it is capable of carrying 100 pounds of steam for years. The water is all right; 80 pounds of steam are indicated; the engine does its work splendidly; engineer and owner are well pleased, when suddenly there is no boiler there, and a number of lives have passed away with it. Again, our boiler inspector is called upon to explain. He solemnly swears that the cause was expansion and contraction, superinduced by low water. There are people who think and sometimes indulge in speculations, that are unfortunate enough to disagree with him. The truth in this case might be: first, neither the engineer nor owner was aware that a new boiler should be thoroughly cleaned before putting it to its work. In the process of its manufacture more or less oil and grease found their way into the boiler. Upon heating the water and converting it into gas, the oil becomes very volatile, and more or less of it clings to the upper part of the shell. The vacuum above the water, occupied by the gases, is dry and much hotter than the water below it. The result is the oil or grease, volatilized and clinging to the shell, ignites, and as quick as thought the hot, dry gases combine, and produce an electric flash, which in an instant converts the water in the boiler into an almost infinite "force" that expends itself in tearing the boiler to pieces.

It may be objected that there are doubts about the possibility of the heat being sufficient to ignite the oil. That the oil is very combustible no one will dispute—more so than wood at least—and whoever has worked around a saw mill with its boiler exposed so that the wood dust can settle upon it, has seen this dust take fire and consume from heat conducted by the iron of the boiler. This occurs on the outside of the boiler and is subject to the cooling influences of the atmosphere, and it requires no stretch of imagination to convince a reasonable mind that the heat is more intense on the inside. I think I know of just such an explosion. The engineer by mere chance was saved, and swore to 80 pounds of steam and full gauge of water. So much for this theory.

There are at least scientific data enough to warrant investigation and practical tests. It is too expensive an undertaking for private capital, and Government should furnish the means to make the necessary experiments. With the vast and fast increasing amount of steam power used in the country, and in view of the property and lives destroyed by ignorance almost daily, it is time the matter was taken out of the hands of scribblers, and well authenticated

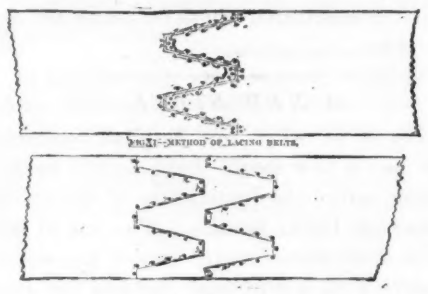


FIG. 2.—METHOD OF LACING BELTS.

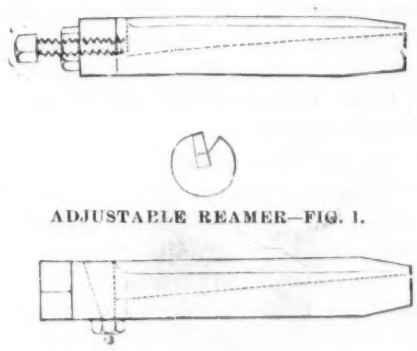
causes, effects and preventives established. In the absence of these I would suggest the following: 1. If you wish to purchase a boiler, know that all its defects have been discovered by a competent person. 2. Never steam up a new boiler before giving it a thorough cleaning. 3. Never use lime or mineral water if it can by any possibility be avoided. 4. Never employ an engineer who is not scrupulously neat and orderly in his habits and of more than ordinarily quick perception and caution. 5. See that the necessary chemicals are always on hand to keep scale from forming. "An ounce of prevention is worth a pound of cure." GALVINI.

BISMARCK, Mich., March 24, 1884.

Adjustable Reamers.

N. A. Neilson in Industrial World.

Figure 1 represents an adjustable reamer with only a single cutter, moved by the aid of a tapered key and check-nut. Figure 2 exhibits a similar tool, in which the cutter is moved



ADJUSTABLE REAMER—FIG. 1.

FIG. 2.

by the aid of a set-screw and secured by a check-nut. The cutters are made to a proper fit in the geared groove, shown in the cuts.

Method of Lacing Belts.

"Old Clothes" in American Miller.

I have noticed in your paper a number of articles upon belt lacing, illustrated with cuts. I send you a sketch representing an eight-inch belt running a four-foot wheat stone, which has been in use for eight years, and is apparently in as good condition as ever. Fig. 1 shows the belt after being laced; Fig. 2 is the belt prepared for lacing. Any one adopting this plan should use a single lace, cutting the holes as close together as they think proper. My reason for using this style of lacing is that it makes a permanent as well as a very smooth running lace, causing no jumping or jarring whatever.

Apprentice Mechanics.

H. G. Brooks, President and Superintendent of the Brooks Locomotive Works, outlines in the following announcement a new system of employing and aiding apprentices established in his works. Mr. Brooks's idea commends itself to all interested in mechanical training:

From and after January 21, 1884, apprentices will be admitted to service in these works under the following rules, and no deviation will be made therefrom: All applicants must possess a good moral character, must be 18 years of age, with a fair knowledge of the ordinary English branches of education, and must write a legible hand. Applications must be made to the office in writing, and must be written by the applicant. An applicant must possess a natural aptitude for mechanics, and have a settled personal desire and purpose to become a skillful and competent workman. The term of service for apprentices will be three years. The compensation for the term will be; First year, 7½ cents per hour; second year, 9 cents per hour; third year, 11¼ cents per hour; ten hours constitute one day's work. Apprentices will be required to attend the night school such evenings in the week as may be designated for such purpose. Tuition and books are furnished free of charge, and from the date above mentioned attendance in the night school will be obligatory upon all apprentices who enter our service thereafter. Neglect of this privilege will be considered cause for immediate dismissal from our service. This company cannot guarantee continuance of service during the full term of apprenticeship, as the ability to do this must be regulated by the conditions of their business, but they will do the best possible for their apprentices.

It is the intention of this company to institute a high standard of excellence among their apprentices. First, by refusing all unfit applications; and second, by using special endeavors to offer them every advantage to become not only skillful and competent workmen, but also to educate them in the principles underlying mechanical construction, and afford them opportunities to study and practise elementary mechanical drawing. Hence, no applicant will be accepted until a full investigation of his character and elementary education is made. An applicant must be eighteen years of age, must make application in his own handwriting through the mail, addressed to our office, and must be prepared to furnish credentials of his character, education and aptitude for mechanical pursuits. Applications proving satisfactory upon investigation will be placed on file in the order of their application, and accepted applicants will be advised when their services are required.

Shrinkage of Castings.

In making allowance for shrinkage in casting, pattern makers understand that different shapes will shrink differently. The standard table of allowance for shrinkage in use in the best shops of the country is as follows:

For Loam Castings	1-12 inch per foot.
" Green Sand Castings	1-10 " "
" Dry " "	1-10 " "
" Brass Castings	3-16 " "
" Copper "	3-16 " "
" Bismuth "	5-32 " "
" Tin "	1-4 " "
" Zinc "	5-16 " "
" Lead "	5-16 " "

Boxes, Bearings and Journals.

Sawmill Gazette.

Crank pin boxes and main shaft bearings should be of phosphor bronze bearing metal, or of good gun metal (copper and tin), or genuine Babbitt. The journals should be kept accurately in line, and the fit should be just close enough to allow the flow of oil to pass. If too tight, they will heat and sweat; if too loose, they will pound and wear, and if out of line, they will do all three.

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To Machinists, Manufacturers and Others.

THE publishers of the IRON TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinists and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised before sending to press.

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IS THE "MODERN ENGINE" MODERN?

The recent discussion by the Cleveland Civil Engineers' Club, fully reported in these columns, has awakened considerable attention throughout the country, especially among the builders of pumping engines. Some of the assertions made in the course of the debate were very sweeping and, if established, certainly do not speak well for our boasted advancement in steam engine building. If it be true, as claimed, that no progress has been made in steam engines during the past 50 years, it is high time that we know it. Certainly one does not need to look far in current technical literature for corroborative evidence on this point. In a series of articles on "The Most Economocal Steam Engine," the *American Engineer* makes these striking admissions:

Of all forms of prime-movers the steam engine is that in most current use, and the aggregate horse-power developed by steam engines the world over far exceeds the power of all motors combined. At the same time its economy, limited as it is by the second law of thermodynamics, does not attain a greater degree in practice than to secure a given useful mechanical energy at the expenditure of about ten times its equivalent heat energy in the fuel. The loss is immense, and a great improvement is not in store, though, when the large number and horse-power of steam engines used is considered, every per cent. of increased economy means a large item in dollars and cents. We have seen in the articles of this series preceding the present one, how this 10 per cent. of efficiency of fuel migh be increased, though it has also appeared how questions of cost of plant and other items of expense at times even tend and make it imperative to lower the attainable fuel economy, to secure true commercial economy, that is to obtain the desired horse-power for the least current cost of money. The most hopeful outlook does not permit us to expect an economical working of the steam engine and boiler combined, with an efficiency of fuel exceeding 20 per cent.

Quite as sweeping is the remark taken from high technical authority, that "there is nothing whatever being done in the United States at the present time to determine accurately the relation between expansion and condensation of team in cylinders of engines now under various conditions." That steam users abroad as well as at home feel this need is evident from the fact that the Institution of Civil Engineers of Great Britain has for the last two years, if not longer, invited the reading of papers on "The Type of Steam Engine Best Adapted for Ordinary Factory Purposes in Respect to Economy in First Cost, and in Cost of Working or Maintenance," the wording of the title clearly indicating an appreciation of the fact that seemingly high duty may be obtained at the expense of other items equally as important from an economic point of view. We are aware that there is another side to the question, and, since the criticism of modern engines comes from some of the leading men in our national and local engineering societies, it is not only desirable but highly important that the side of the engine-builders should be fully and fairly presented. For such presentation these columns are open at any time.

A NEW STEEL.

Specimens of what our English exchanges refer to as "a new steel" have lately been on exhibition before the Institution of Mechanical Engineers of Great Britain. The use of manganese in steel manufacture is well known, but the discovery of a practical method for introducing larger proportions than 1 per cent. of manganese so as to make the new process a commercial success, brings this "new steel" at once into great prominence. Although reference was made in these columns sometime since in regard to the experiments then going on, under the direction of Messrs. Hadfield, of Sheffield, it may be well to explain just what has been accomplished within the past few months. As the result of extended experiments, the inventors at last discovered that by adding the ordinary ferro manganese of commerce to iron or metal, either wholly or to a great extent decarbonized and refined, and treated by any of the ordinary processes, or to steel produced by such processes, in increased proportions sufficient to obtain or produce in the steel or decarbonized iron under treatment a percentage of manganese, varying from 7 to 20 per cent., the most beneficial results could be obtained. The steel thus manufactured is said to be harder, stronger, denser and tougher than most steel now made, even when forged and rolled. For casting, it has the advantage that it possesses greater freedom from honeycombs and similar defects; but the most peculiar property is its great toughness, combined with extreme hardness. It is through this that the hitherto indispensable processes of rolling, forging, hammering, hardening and tempering may be dispensed with, thus effecting for many articles an enormous econony in time, labor and expense. Quite as important, in many respects, is its quality of resisting oxidization, even when tested in sea water.

A RAILWAY INVENTION BUREAU.

Some time since we first called attention to the good work proposed by the Humanitarian Invention Association, whose headquarters are at Youngstown, O. As an outgrowth of this effort to encourage and assist deserving inventors, we have a Railway Invention Bureau, organized for the purpose of furnishing a convenience for railway corporations, associations, and individuals, by examining and having tested inventions pertaining to railway interests, at the same time offering to the inventors of such appliances an opportunity of having their novelties examined by a competent board of experts, whose favorable estimate of a patent or invention would be accepted, as far as practicable, by railroad operators. Its design is also to enable car builders and superintendents a favorable opportunity of knowing what is most desirable among patents examined by the Bureau, and the defects of each, while it would relieve railroad officers and mechanics from the unprofitable labor of examining the many things brought to their attention. In a word, the plan contemplates the sifting out of all impracticable inventions, and recommending only such as may conform to an established standard of merit. The expenses of operating the Bureau are to be met by the payment of a nominal fee by parties for whom examinations are made.

In his recent address before the Civil Engineers' Club of Cleveland, Mr. Charles Latimer, Chief Engineer of the New York, Pennsylvania & Ohio Railroad, referring to the need of a National Museum of Railway Appliances, in order to enable railway managers to discriminate betweeen the good and bad in the thousands of railway inventions presented for their consideration, said regarding the single item of frogs: "We are using frogs which might not pass muster, for to some a frog is a frog, and they do not question whether it is of the right dimensions, right manufacture, or of the right pattern, but many of them, taking everything for granted, lay them in the track as a trap." And of the switches in use, he said: "We have thousands of miles of our roads using the switch first invented, which no expert can possibly apologize for or sustain the use of, in any court in which evidence was freely brought in case of accident." These are the carefully chosen words of an expert engineer and are entitled to full consideration. Perhaps we have in the Railway Invention Bureau the nucleus of what our railway managers so greatly need.

HORSE POWER OR HORSE POWERS?

We have received the following query:

TO THE EDITOR:

Please answer the following inquiry in your paper: What is the the plural of horse-power? Is the expression 30 horse-powers correct? J. B.

PITTSBURGH, Pa., March 21, 1884.

Taking the United States Census Bureau as authority, it would appear that there is no plural form of "horse power." Grammarians would say, we suppose, that, being a noun of multitude, it is always used in the singular form. The New York *Tribune*, also good authority, makes a like use of the word, as in this example: "From these tables it appears that in all 3,410,837 horse-power is employed in manufactures." "Thirty horse powers" would not, therefore, appear to be correct.

THE MULTIPLICATION OF MOTORS.

Still the discovery of new motors of marvelous power goes on. First we have the announcement that the now celebrated Keely Motor is finished, "all but pitching the 'vibratory pins' and adjusting the spirometer," and again the stock holders are agitated at the prospect of an early exhibition of its powers. Then comes the story that a Philadelphia mechanic has succeeded in penetrating Mr. Keely's much-guarded workshop and stealing his secret, acting upon which he has constructed a motor which recently ran a hand-car on the West Jersey road at the rate of about 75 miles per hour. And last but not least, we have the "Triple Thermic Motor," the invention of a Pittsburgh mechanic who has, it is announced, just organized a company in Chicago with $25,000,000

capital for its manufacture. As the primary power of this motor is derived from bi-sulphide of carbon, it may be in order to quote from a recent note to the editor from a well-known Eastern mechanical authority: "The bi sulphide engine 'biz' is as old as the hills and turns up annually. It is no good, and is only used as a lever to pry money out of people's pockets. I had one 25 years ago, and since that time no change has been made." It remains to be demonstrated whether or not the "Triple Thermic" is supplied with the "lever" referred to by our somewhat caustic correspondent.

EMPHASIS is placed by Secretary Hutton, of the American Society of Mechanical Engineers, in his circular announcing the Pittsburgh meeting, upon the importance of members presenting only papers of the hightest PRACTICAL value (the capitals are those of the circular). This is doubtless in response to a growing sentiment against long-winded papers of a purely theoretical character, the undoubted tendency of such being to drive away men of practical ideas. On the other hand, there is danger that too much prominence be given the practical, to the exclusion of matters which, though not strictly in the line of shop practice, are of quite as much importance to the engineering profession. We quite agree with the *American Engineer*, therefore, in its position that "the great stress laid upon the term 'practical' in the circular may lead some of the members to suppose, as has been the case in the past, that trifling questions of practical detail and manipulation in engineering matters are to be dilated upon at length and presented with a grand flourish of professed importance," which details "should preferably be dedicated to the mechanical or trade press."

VALUABLE improvements in the casting of iron have lately been made in England. From the cupola or furnace the molten metal is run into a well or tank having inlet and outlet at the bottom, the scum scoria and like objectionable matter being caused to remain in the inlet way, whilst only the liquid and purified iron finds its way into the tank, to be thence run into the molds. If the iron contains phosphorus, sulphur, or other substances removable by chemical means, the suitable reagent for effecting the removal is filled into the inlet way, and the molten iron on its way to the tank is thus brought into intimate contact with the re-agents, and the removal of the impurities is effected. The re-agents to be used are lime, limstone, alkalies, carbonates, nitrates, and such other substances as are known to effect the desired object.

To prevent the dropping of fine iron chips from the wheels of the New York elevated railroad cars into the eyes of pedestrians below, it is suggested that magnets be attached over the brakes or shoes. This has been done with excellent results in flouring mills, for ridding the grain of pieces of wire used in binding the sheaves.

WOMAN'S INVENTIONS.

From various sources, chiefly from a recent article in the North American Review, by Mrs. Matilda Joselyn, we compile a list of some of the inventions which owe their existence to woman's ingenuity:

The system for the combination of teeth and cutter-bars in mowers and reapers was perfected by Mrs. Anna Harned Manning, of Plainfield, N. J., in 1817-18.

The improvement in mowers and reapers whereby the knives can be adjusted while the machine is in motion was the invention, in 1861, of Elizabeth Smith, also of New Jersey.

Madame DeLong is about to introduce into England the metal-cutting machinery of her invention which has for some time been in use in France. It is worked by steam power and cuts with the utmost precision the hardest and softest metals, in any design.

An effective noise-deadener for elevated railroads is the fruit of the brain of Mrs. Mary E. Walton, occasioning much comment.

Miss Maggie McKnight, of Amherst, Mass., is the inventor of a machine for manufacturing paper bags, as well as of a machine for folding bags, she herself superintending the erection of the same.

A woman has invented a rotary loom, doing three times the work of the ordinary loom.

A woman has invented a screw crank for steamships.

A woman has invented a spark-arrester for locomotives.

A woman has invented a lubricating felt for subduing friction in journals.

A woman invented the cotton-gin—and still the list is far from complete.

IN Australia they are annealing chilled iron castings by the very simple process of dipping them, when at a dull red heat, just as the redness is about to disappear, into a liquid composed of a solution of treacle and water, or almost any liquid free from acids. The iron as it comes out of the bath is found to be capable of being punched, bored or tapped as readily as wrought metal.

THE commission of medical and mechanical experts appointed by the Humanitarian Invention Association to pass upon the models of invalid chairs entered for the $3,000 prize offered by the Association have reported that "none of the competitors have fully complied with the essential conditions, on account of the designs being inferior to invalid chairs already in use."

THE inventor of rivet-making machines is dead. Oliver Edes was his name, and Plymouth, Mass., his home. His first patent was taken out in 1837.

THE WAR OF THE STEAM PUMPS.

ENGINEERING CIRCLES SOMEWHAT STIRRED UP.

Letter from Mr. Porter Regarding Recent Criticisms of the Saratoga Engine.

The publication in full by this journal of the recent papers by Mr. E. H. Martin, a leading mechanical engineer of this city, on "The Pumping Engine of the Period," and our subsequent full report of its discussion by the Civil Engineers' Club of Cleveland appear to have awakened very general interest in engineering circles throughout the country. Letters have been flying about in numerous directions and the demand for extra copies of the issues in question has been quite brisk It will be remembered that Mr. Martin, in criticising modern pumping engines as being little if any in advance of those consiructed 50 years or more ago, referred in the discussion, by way of illustration, to the high duty claimed for the Gaskill engine at Saratoga, N. Y., giving at the same time the results of his personal observations at Saratoga last summer and charging that the exceptionally high duty claimed was obtained by means of a by-pass which, in fact, caused the water to return to the cylinder and be pumped twice. In referring to the official report of Mr. Charles T. Porter on the performance of this engine, Mr. Martin paid a high tribute to Mr. Porter's standing as an expert and as a man, but thought he (Porter) might have been deceived. To this interpretation, as well as to the charge that the engine in question has not reached the high duty claimed, Mr. Porter, as will be seen below, puts in a vigorous rejoinder. His letter, addressed to Mr. Holloway, of this city, President of the Civil Engineers' Club, was not originally designed for publication; but in view of the widespread inquiry which has been awakened, Mr. Porter has authorized its publication in the columns of the IRON TRADE REVIEW. No doubt it will be read with much interest by the mechanical engineers of the country:

NEW YORK, March 17, 1884.

J. F. Holloway, President Civil Engineers' Club, Cleveland, O.

DEAR SIR: I am in receipt of a copy of the of the IRON TRADE REVIEW of March 1st, containing what purports to be the proceedings of the February meeting of your Club, and among which I find the criticisms of Mr. Martin and Mr. Whitelaw, upon the report made by myself on the performance of the Gaskill pumping engine, at Saratoga. As perhaps few members of the Civil Engineers' Club, and few of the readers of the IRON TRADE REVIEW have had an opportunity to read my report entire, it would seem proper that I should state the facts respecting the two causes of error specified, namely, the by-pass and the valves of the pump.

The by-pass valves were shut during the trial, and during all my observation of the engines, except when I opened them myself for a few minutes to observe the effect. Then the noise of the water rushing through them could be heard out-doors when the doors were shut. So the number of intelligent and careful observers always on duty, three in the engine room besides myself, could not have failed to know it, if these had not been quite closed, as the engine ran in entire silence, except the sound made by the four valves of the high pressure steam cylinders in closing.

The pump valves have a lift of only 5-16", and are heavy. Under the conditions of great differences of pressure on their opposite sides, they must have closed more rapidly than gravity would cause them to do. This, however, was assumed as their closing velocity. The diagrams from the pumps showed conclusively that there was no appreciable loss past these valves, by the instantaneous rise and fall of the pressure at their ends. I showed the percentage of steam that was condensed on entering the cylinders and also that the economy was what was reasonably to be expected, the boiler duty being over nine lbs, and the consumption of steam per horse power exerted in the high pressure cylinders being 30 lbs per hour. The back pressure in these cylinders was less than 12 lbs, or fourth-fifths of an atmosphere. Now any good non-condensing engine with a back pressure of 16 lbs, or one third more than that existing here, will work, cutting off same steam pressure at same point in the stroke, with a consumption of 25 lbs. of water per horse-power per hour. So this was really no great economy, and I so distinctly stated, although so much greater than we are accustomed to in pumping engines. That it was actually realized there can be no manner of question.

I am, very truly yours,

CHARLES T. PORTER.

Insufficient Rapid Transit in New York.

New York Sun.

There can be no doubt that the city has outgrown the elevated railroads. They have nearly reached the limit of their carrying capacity with their present stations and locomotives, and they are only able to transport all the passengers during the commission hours by cramming their cars and subjecting the waiting throngs to much inconvenience.

Yet at those hours the trains are now run as closely together as safety permits, and they are made up of as many cars as the length of the stations justifies. It is plain, therefore, that in order to adequately serve the convenience of the public our facilities for rapid transit will soon need to be much increased. As it is, despite the competition of the elevated railroads, the horse cars are doing a business which steadily becomes more thriving.

The Loss of Steam.

American Engineer.

The decrease of pressure of the steam in its passage from the boiler to the cylinder is due quite as often, indeed more frequently, to the contracted area of the stop and throttle valves, rather than lack of sectional area of the main steam pipe, though as a rule the latter feature is considered the all important one in the problem. The actual area (that is independent of all ribs, guides, etc.) of the seat of a valve should under no circumstances be less than that of the steam pipe to which it is attached.

SULPHUR DETERMINATION IN STEEL.

BY MAGNUS TROILIUS.*

The method of using the bromine process of determining sulphur in steel, described below, is in successful use at the Midvale Steel Works. Ten grains of drillings are weighed out and put into the ½-liter flask A, with long neck. The flask is connected with a wide glass tube C, which, in its turn, is connected with the absorption bulbs B, containing HCl, 1.12 specific gravity, and about 5 c. c. of bromine. The wide tube C causes the vapor to condense and flow back into the flask A during boiling. The bulbs B connected with a large glass tube, which may be made to carry off the bromine fumes through a hole in a window, or, better still, through a flue with a powerful draft.

The connections being made, 100 c. c. of boiling water are run in through the thistle tube T. The air is thus completely driven out of the flask. 100 c. c. of HCl (about 1.19 specific gravity) are then run in. When the gas begins to run rather slowly through B, heat is applied until boiling gradually ensues. The steel being completely dissolved, the apparatus is disconnected, and the contents of B rinsed out into a beaker of 100 c. c. capacity, into which a few c. c. of a concentrated solution of $BaCl_2$ have been previously introduced. Heat is then applied (best by means of the hot iron plate) until the bromine is completely driven off and the $BaSO_4$ has settled nicely to the bottom. The $BaSO_4$ is then filtered off on a small double filter, washed with hot water, and finally ignited and weighed. The filter should always be put into the crucible whilst still wet.

The method now described is very rapid, and thus very useful in practical working, but it is at the same time scientifically superior to all other methods for determining the sulphur in steel as $BaSO_4$, there being no bases present by which the $BaSO_4$ can be contaminated. Even for pig-iron the method answers very well, no appreciable amount of sulphur being left in the residue. As for sulphur being retained in the residue as CuS, when the amount of copper is considerable, this is a matter of rare occurence, and the presence of 1 per cent. of copper or so would certainly be reason enough for a special searching investigation, not necessary during running work. A steel containing .30 per cent. of copper gave .16 per cent. of sulphur, both by the aqua regia and the bromine method, and a spiegel with 9 per cent. of Mn and ½ per cent. of Cu gave traces of sulphur by both methods.

During the passage of the gas through B oily drops of propyl-bromide are formed, which, however, disappear on heating.

For working many determinations at the same time, it is convenient to have a large number of long necked flasks, into which the different samples are weighed out, and a corresponding number of bulbs, filled and suspended in a row in a box of some convenient form. The flasks should be perfectly dry before placing the drillings in the same.

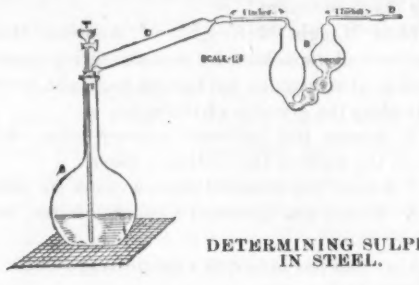
Some chemists of standing say that the "bromine" method gives too low results, owing not to incomplete separation of the sulphur in the gaseous state, but to the formation of some combination with carbon, which cannot be retained by the bromine solution.

Whilst I, for my part, do not consider it likely that any such non-absorption would take place, I may add that my own experience during two years of constant practice with the "bromine" and "aqua regia" methods has shown, that it is very difficult, particularly in the case of pig-iron, to obtain the $BaSO_4$ free from SiO^2, not to speak of other contaminations by the aqua regia method. If, to avoid this error, a very high temperature be used for separating the silica completely, SO_3 may be lost, and thus too low results obtained. The differences in results, when care and skill are used, are indeed not greater than would justify the conclusion that the higher results sometimes obtained by the aqua regia method are due to impurities contained in the $BaSO_4$.

*Read before the American Society of Mining Engineers at the Cincinnati meeting.

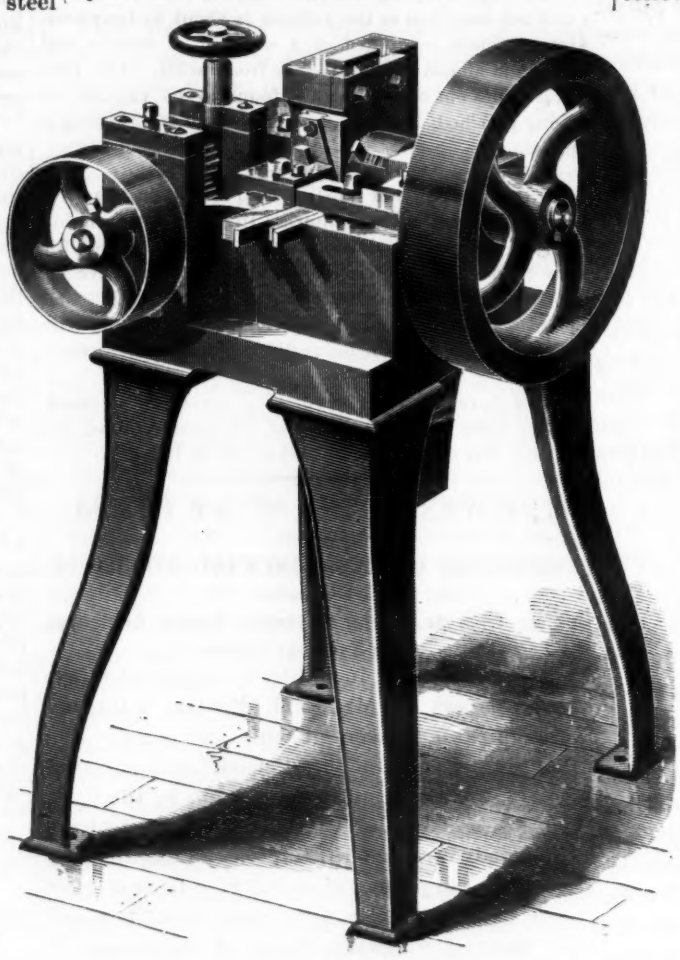
Automatic Shear Point Staple Machine.

The automatic shear point staple machine, herewith illustrated, is capable of making shear



DETERMINING SULPHUR IN STEEL.

point fence and other staples, at the rate of 500 per minute while running. It is entirely automatic, taking the wire directly from the coil, cutting and forming the staple at one operation. The manufacturers are Messrs.



AUTOMATIC SHEAR POINT STAPLE MACHINE.

John Adt & Son, New Haven, Conn., builders of machinery for hardware manufacturers. With each machine they furnish a complete set of tools for making staples from ¾ to 2½ inches long, from 3 16 and smaller wire. They can also furnish machines for making all sizes and lengths of shear point staples. They are now busy on machinery for hardware and agricultural machinery manufacturers and manufacturers of other goods requiring wire-working machinery.

Uniformity of Shop Heat.

Scientific American.

Measurements of the metals in working are reduced to such exactness that very slight changes of external conditions affect their integrity. When a company that produces exact standards of measurement claims an accuracy of one five-hunndred thousandth of an inch in linear measurement, and advertises to produce it, and another producer of tools of exactness insists on fitting work to one fifty-thousandth of an inch, it may be considered that extraneous influences not formerly noticed may be sufficient to seriously affect these measurements. One of these influences is that of shop temperature. Exact measurements must be taken under certain temperamental conditions; when these conditions vary within limited periods, or while the job to which they pertain is in progress, there will be a difference that in some cases would be sufficient to impair the accuracy of the work. In one instance noted, a planer stood by the wall of the shop, the head upright close to a window. When the planer stopped on a winter night there was on its platen a lathe bed nearly finished, the Vs lacked only the finishing chip. The tool carriage on the cross saddle had been left on the inner or shop side. In the morning, after a blustering, cold, windy night, the operator thought to test the theory of cold contraction, and he set the square-nose finishing tool to touch the top of the V on the shop side and ran it across to the wall side. The cutter scored across the cold side of the planer, plowing a gouge of at least one thirty-second of an inch deep in the opposite V, a distance from the other V of but little over two feet.

Cast Iron in Steam Boilers.

Journal of the Franklin Institute.

At a recent meeting of the Franklin Institute, at Philadelphia, S. Lloyd Wiegand offered the following resolutions: "That the Committee on Science and Arts be requested to ascertain and report the properties of strength of cast iron, as a material for construction of boiler heads and other vessels rof retaining fluid under pressure, together with such rules for estimating the strength and proportioning of such structures in the different forms now in use, with economy and safety, and also the proper modes of testing and using such structures, as will be useful to those practically engaged in the manufacture and use thereof." Mr. Wiegand, in offering this resolution, stated that public attention has been recently directed to the fact that cast iron is extensively used in the construction of boilers, and most notably in the heads of cylinder boilers. Many such boilers have flat heads, and expressions of opinions, alleging flat cast iron boiler heads to be dangerous, have been recently made, and reiterated in terms and with a frequency calculated to incite grave alarm, not only on the part of the users and owners of such boilers, but in the minds of the public generally, and to produce an impression that such boilers are necessarily a menace to property and life. The criticisms against such structures have not assumed any such exact expressions as to show where safety ceases and danger begins, but they have been condemned apparently without a hearing, as dangerous and treacherous always and under every condition.

Power of Springs.

The elastic power of a spring is directly as the fourth power of the diameter of the rod of which it is made, and inversely as the diameter of the coils. The diameter of the coil at the center should be eight times the diameter of the rod or wire.

Diameter of coil at center. In.	Diameter of rod. In.	Elastic action per coil. In.	Working load. Lbs.
4	½	¼	896
3½	7-16	7-32	600
3	⅜	3-16	378
2½	5-16	5-32	218
2	¼	⅛	112
1½	3-16	3-32	47
1	⅛	1-16	14
½	1-16	1-32	1¾

Experiments with steel helical springs—Extension: A ¼ in. wire spring, 2 in. diameter of coil at center, 38 coils, and 10½ in. long, with 56 lb. extended to 13⅜ in. long, 84 lb. to 14½, 98 lb. to 15¼, and 112 lb. to 16 in. Compression: A ⅞-in. spring, 6 in. diameter of coil at center, 5½ coils, and 8½ in. long with 6 cwt. compressed to 7¾ in., 7 cwt., to 7⅝ in., 8 cwt. to 7½ in., 9 cwt. to 7⅜ in., 10 cwt. to 7 3 16 in., 11 cwt. to 7 1-16 in., 12 cwt. to 7 in., (bare), 13 cwt, to 6 13-16 in., 14 cwt. to 6 11-16 in., 16 cwt. to 6½ in., and 18 cwt. to 6¼ in.

COMMUNICATIONS from practical men on practical subjects are always desired.

Manufactures.

CLEVELAND.

THE bar mill of the Forest City Rolling Mill is undergoing extensive repairs.

MESSRS. CLEVELAND, BROWN & Co., of this city, have assumed the operation of the Ward mill at Niles.

THE Emma furnace is now in blast, having been temporarily shut down on account of scarcity of coke.

ON a recent night turn, 63,000 pounds of steel hoops were made in the Cleveland Rolling Mill Co.'s works.

MESSRS. CAMPFIELD & SUTLIFF are now running on their improved wrenches and have lately taken large orders from Canada parties.

SINCE the introduction of the "Monitor," in 1875, over 275,000 of these popular stoves have been made and sold by the Monitor Oil Stove Co.

IT is expected that the 8 and 9-inch guide mills of the Union Rolling Mill will start up March 31, and the bar and puddle departments a few days later.

MR. W. M. GOBEILLE last week retired from the firm of Gobeille Bros., Mr. Jos. Leon Gobeille continuing the business under the name of the Gobeille Pattern Works.

A FURTHER modification of the new steel mill plant of the Cleveland Rolling Mill Co. will be necessary, as it now takes too long to get the heated ingots through the rolls. The Gustin process, however, works to perfection.

THE report of Assignee L. A. Wilson in the matter of the failure of Thomas R. Reeve, the proprietor of the Novelty Iron Works, shows the total liabilities to be $12,112.53. The total assets are $56,708.56. On these are mortgages to the amount of $25,167.

CHARLES L. CHAMBERLAIN, a sportsman of local note, after eleven years' study, has perfected a machine capable of charging 1,500 shotgun cartridges an hour. Cleveland and Pittsburgh capitalists have organized a company, with $250,000 capital, to establish a manufactory here.

THE item going the rounds of the technical press, thea the "Ohio Steel Works," of Cleveland, are manufacturing 3,000 pounds of fine steel for use in the manufacture of a monster cannon for the Government, does injustice to the Otis Iron and Steel Works, which, in fact, have the contract.

THE American Wire Co. issued a circular March 15 as follows: "The upward tendency in prices of wire rods, coupled with the steadily improving demand from the wire fence manufacturers, is having its effect on the market. We therefore beg leave to withdraw all quotations on wire."

CONCERNING a recent important change in the Cleveland shops of the road mentioned, the American Machinist says: We are informed that the Cleveland, Columbus, Cincinnati & Indianapolis Railroad Co. have abandoned the building of locomotives altogether. For nearly two years they turned out a new engine from their own shops every three weeks, but close calculation of the expense convinced them that they could purchase engines from contract shops cheaper than they could build them.

THE following from the New Castle (Pa.) Guardian is of local interest: Mr. N. W. Taylor, of the Cleveland Paper Co.; Mr. I. W. Pope, of the Chagrin Falls Paper Co., and Mr. Foster, the attorney of N. W. Taylor, were in the city last week consulting with the New Castle Paper Co. Mr. Taylor wants to join in with the members of the New Castle Paper Co. here and rebuild the Paper Mill. They speak very highly of the adaptibility of the site of the late Paper Mill for the manufacture of that article.

WORK progresses upon the iron steamship at the Globe Works. Her dimensions are as follows: Keel, 247 feet; over all, 262 feet; beam, 73 feet; molded depth, 22 feet. She will have water ballast bottoms divided into six compartments, five athwart ship's bulkheads from keel to spardeck, of iron, and water-tight. There are two decks. Her engine will be compounded 27 and 52x36 inch stroke; one steel boiler 10½ feet in diameter by 18 feet long, allowed to carry 100 pounds steam; steam reverse engine. She will have a large duplex pump for handling water ballast and a cable hoisting engine for handling cargo and making sail, Globe Works patent windlass, operated either by hand or steam.—[Herald.

THE manufacture of a molding machine that is intended to do away entirely with hand molders will soon be commenced in this city. The Sweet Molder Co. was organized Monday with a capital stock of $50,000, and the following officers elected: President, A. N. Benson; Vice President, S. H. Schmuck; Secretary, Charles A. Cook; Treaaurer, L. C. Beardsley; directors, A. N. Benson, S. H. Schmuck, Charles A. Cook, C. T. Sweet aud Daniel Ruck. The location of the works has not yet been decided.

THE Cleveland Variety Iron Works are building two large tubular boilers for the Hartman Steel Co., of Beaver Falls, Pa. This makes a total of 15 boilers which they have furnished that company. They are doing other work as follows: A marine boiler for R. D. Pike, of Bayfield, Wis., and one of the same for Mr. Murphy, of Detroit; a large tubular for Arctic Ice Machine Co.; also a large still for Forest City Chemical Works and a steel compressor to press ingots of steel for the Gautier Steel Co., of Johnstown, Pa.

OHIO.

THE Gill Car Manufacturing Co., of Columbus, have assigned and have no hope of resuming.

TWO ENGINES, two sets of boilers, &c., have lately been put in at the Akron furnace, located at Buchtel.

SINCE December last the stove molders of Cincinnati have been on a strike, but an early adjustment is expected.

THE United States Fire Clay Co. at New Lisbon will employ 150 men. Eight kilns are being built and the company expects to have ware for sale in ninety days.

BY the retirement of Mr. N. B. Watson and the accession of Mr. Samuel Grove, Sr., the well-known firm of Edwards, Grove & Watson, Salem, becomes the M. L. Edwards Manufacturing Co. Their specialty is the manufacture of patent machinery.

THE suit of the Lima Car Works against 24 citizens of that city for a balance due on subscription raised when the car works were located there has been on trial for several days, with a verdict in favor of the works. The suit involved a large sum of money.

MESSRS. W. H. Baldwin, Tod Ford, F. S. Presbrey, Wm. P. Manning, C. H. Gilman and Thad Woodman are the stock-holders in a new manufacturing company organized at Youngstown, with $10,000 capital, for the purpose of manufacturing hardware specialties.

THE Alliance Paint Co. has entered extensively into the manufacture of roof paint for both metal and wood work. Its strong points are its elasticity on metal roofs, its fire-proof quality on shingles; its flexibility, its capability of standing a high degree of heat (500 deg.) and the fact that it will not run, scale, crack, blister or chalk up.

THE citizens of Massillon have decided to donate to Witherell & Wells, of Bellaire, the old Volcano furnace property—17 acres of land—and $6,000. The latter are to take to the former city a window-glass manufactory which is to employ 50 men and expend about $1,200 weekly in wages. The plant is to cost $60,000.

THE contract for roofing the World's Industrial and Cotton Centennial Exposition at New Orleans, La., (the largest building in the world except the one at at Louisville), has, we learn, been awarded to the Cincinnati Roofing Co. to be covered with their "AA" patent interlocked joint roofing. There is about 1,300,000 square feet, or 33 acres space to be covered. The contract was awarded to them over some 20 competitors from all parts of the world.

IN GENERAL.

H. BREWER & Co., Tecumseh, Mich., engine builders and machinists, have completed an addition to their works, 76x54 feet, two stories high, and are putting in new machinery.

THE Valley Rolling Mill of the Stewart Iron Co., Sharon, Pa., which was idle for several months, again has its fires lighted. Ten furnaces are on making Bessemer blooms. Orders have accumulated and Manager McClure expects that the mill will have a steady run.

MR. L. J. PENDER, Union City, Ind., is erecting a shop in connection with Smith Bros. for the purpose of manufacturing portable and stationary boilers of all sizes, from one to 100 H. P., also all kinds of sheet iron and tank work. Mr. Pender is an old and experienced boiler-maker.

SCHLEICHER, SCHUMM & Co., of Philadelphia, are turning out Otto gas engines very steadily, averaging 30 of all sizes per month. One manufacturing concern in Milwaukee recently ordered their fourth 10-horse power Otto gas engine, and all four are now working side by side in their establishment.

Among the Blast Furnaces.

RANEY & BERGER'S furnace, this city, in 24 hours Monday turned out 134 tons of marketable metal.—[New Castle (Pa.) Guardian.

IT is expected that the new furnace of the Brier Hill Iron and Coal Co. for making dephosphorized metal, will be ready in a short time.—[Youngstown (O.) News-Register.

ETNA FURNACE, New Castle, Pa., which has been re-built, was lighted on the 11th inst. Its dimensions are 75x16 ft., and it is supplied with new Mackintosh, Hemphill & Co. engines

A NUMBER of Hanging Rock furnace owners have been sued, or expect to be, for infringements upon Lurmann's patent for a closed front and water-cooled cinder notch. They are reported to be combining for mutual defense.

THE new blast furnace No. 3, of the Pennsylvania Steel Co., at Steelton, which was put in blast on the 8th inst., is 70 ft. high, bosh 18 ft. in diameter, bell 10 ft. and hearth 10 ft. and is supplied with six 6 in. bronze tuyeres. It is of modern construction throughout, with all the latest improvements. A pair of double blowing engines, with a capacity of blowing 30,000 cubic feet of air per minute, are in use; and nine boilers, each 60 feet in length, are used to drive the engines.—[American Manufacturer.

FALLING SPRING FURNACE, at Chambersburg, has lately resumed operations under the management of Col. George B. Wiestling, of Mont Alto, and is producing 17 tons of pig iron daily. The furnace measures 8 feet 4 inches at bosh and is 40 feet high. It has a small hot oven which does not heat the blast to over 500 deg. The furnace is blown by a Weimer engine with a 24-inch air-cylinder, an 11-inch steam cylinder and a 24-inch stroke. To make a ton of iron 5,614 pounds of ore are smelted, and the charcoal (which is of an inferior quality) consumed amounts to 135 bushels per ton of product.—[The Bulletin.

THE Chester Pa., furnace of Taylor & Co. reached an output last week of 304 tons, exceeding its late unusually good weekly average of 290 tons. The ores used were three-quarters Chester sulphury ores, which, previous to going into the blast furnace, were roasted in the Taylor-Langdon ore-roasting furnace. The iron made from these ores is very strong and tough, and is used almost entirely for special mill purposes, thus demonstrating their value when properly prepared and desulphurized The roasting is done with gas made in separare gas-producers, and no coal is used in the roasting furnace. One and half cwt. of pea coal or screenings from the furnace is used per ton of ore roasted.—[Ex.

ACCORDING to report made to the Secretary of the American Iron and Steel Association, the Franklin Iron Manufacturing Co.'s furnace in Oneida County, N. Y, made a run, in the third week of February of 515 gross tons of pig iron of various grades. The amount of fuel (coke) used was 1.12 tons to the ton of ore. The ore yielded 42 7 per cent. of iron. The blast was heated to from 1,400 to 1,600 degrees, and the heat of the escaping gas varied from 250 to 300 degrees. The height of the furnace is 70 feet; diameter at bosh, 14 feet. It will be noticed that the height of the furnace is the diameter at the bosh, which is a greater proportion than it is usual to give. The low temperature of the escaping gas is caused by this great height, which in its turn gives the low fuel consumption.

Market Review.

OFFICE OF IRON TRADE REVIEW,
CLEVELAND, FRIDAY EVENING, March 28, 1884.

IRON ORE.

The selling movement continues, though mostly in small lots for present delivery. Some of the Bessemer mines have sold nearly up to their full capacity, and these are showing a decided tendency to stiffen prices for what still remains unsold. We hear of one sale of 15,000 tons at $6.25 and 700 tons at $6.50. It is a well known fact that while Republic ore has been held nominally at $6.50, large sales have been made for future delivery at $6.00. The price for ore now on dock, however, has been held quite firm at $6.50, and as this season's output is pretty well sold up there is a disposition toward a firmer price in the future though there has as yet been no real advance. Other mines will probably hold firmer, as fast as they near their total production. Some furnaces have already contracted for this season's supply, while others show a disposition to wait and see how the iron market turns. There are some sales of non-Bessemer ores ranging from 500 tons to 10,000 tons, at rates fully equal to last year's prices, as there cannot possibly be the same reduction as in the higher grades As to lake freights, charters have been made at $1.20 from Marquette with up-loads that will run into October, and one charter has been made on conditions, for season at $1.35. From Escanaba $1.10 is the ruling figure. Shipments the the past week have been 15,405 tons, against 11,100 tons last week. We quote:

No. 1 Specular and magnetic Bessemer Ores per ton	$5.75@ 6.25
No. 1 Specular (non-Bessemer) ores per ton	5.25@ 5.75
Bessemer Hematites	4.75@ 5.00
Non Bessemer Hematites	4 25@ 4.75
Menominee Range Bessemer	5.15@ 6.00
Menominee Range non-Bessemer	4 00@ 4.70

PIG IRON.

Some dealers report the pig iron market very dull, while others consider it fully equal to or better than previous months. Sales are all in small lots; mill irons varying from 100 tons to 500 tons, and foundry irons in car load lots. It is reported in some quarters that irons are shipped to Eastern markets to sell for what they will bring in order to maintain Western prices. Furnacemen claim that the recent action of the coke syndicate in advancing prices will increase the cost of producing pig iron from 15 cents to 20 cents, and as a consequence one of three things must happen: either the price of pig must advance, the furnaces blow out, or the makers lose money. They say at no time of the year has the market been in such a condition that they could stand the advance with less grace than at present. Receipts the past week have been 974 tons, shipments 353 tons; against receipts of 1,355 tons and shipments of 139 tons last week. We quote:

CHARCOAL PIG IRON.

No. 1 Lake Superior charcoal	$22.50@24.00
No. 2 Lake Superior charcoal	22 50@24.00
Nos. 3 and 4 Lake Superior	22 50@25.00
Nos. 5 and 6 Lake Superior	22 50@24.00
Nos. 1 2, 3 4, 5, Salisbury	34.50@36.00
Southern Car Wheel	27 50@32.00

BITUMINOUS AND COKE IRON.

No 1 foundry, all lake ores	$20.00@21.00
No. 2 same	19.00@20.00
No. 1 foundry, lake ores, with cinder mixture	19.00@20.00
No 2 same	18.00@19.00
No. 1 foundry, native Ohio ores	20.00@20.75
No. 2 same	18.00@19.50
No. 1 silvery, native Ohio ores	20 25@21 00
No. 2 same	17 00@19 00
No. 1 gray forge, red short	17.50@18.50
No 1 gray forge, neutral	16.50@17.50
No. 1 Bessemer	20.00@21.00

IRON AND STEEL.

The market is still dull but shows signs of improvement so far this month. Trade is in a healthy condition, and prices are reported firm, though it is said that sales of bar iron have been made as low as $2.60, and car axles as low as $2.10 at the mills. Indications point to a good Spring trade, and mill-men expect a little boom as soon as navigation opens.

SCRAP IRON.

Railroad scrap is somewhat scarce, but country scrap is plenty. Prices are not firm and sales are made in small lots only.

A master mechanic of one of our leading roads remarked that all railroads used scrap axles, but these were supplanted by steel axles on account of their wearing longer. It was soon discovered that with steel axles the journals wore out much faster, and then muck-bar was tried; but these while standing the drop test better would not wear as long as the scrap axle; and he claims as a result of the experiment all the recent orders have been placed for scrap axles.

HARDWARE.

There is no decided change in the market. Prices and discounts remain the same. There will probably be less demand for builders' hardware this year than last. Traveling men report an encouraging outlook. Collections are improving slightly.

The United Brass Company is the name assumed by the recently consolidated brass companies, of which mention has been made before.

At the recent meeting of the Axe Makers' Association a reduction was decided upon in that class of goods.

According to the Iron Age it is intimated that an advance of ¼ to ½ cent will be made on barb wire at the next meeting of the manufacturers.

NAILS—There is less demand for nails and a consequent weakening in prices. The collapse of the Eastern nailers' strike will probably have no effect on this market, but the cutting of freight East will have a tendency to send Western nails into the Eastern market.

METALS.

The market is a little more active. Prices remain firm. Spelter, lead and tin, are very firm.

MACHINERY OILS.

The market is very quiet, and no very active demand is noticeable. Prices are weaker on lard oils.

COAL.

Trade still continues dull, with no prospects of immediate relief.

COKE—The small coke producers of the Connellsville region have organized under "The Conellsville Coke Producer's Association" and entered into a contract with the syndicate of large dealers, recently formed, to furnish them their coke exclusively. This gives the syndicate control of the coke trade, and as a result they have advanced the price to $1.00 and announce an advance of 10 cents more each month, beginning with the first of April, until the price shall reach $1.50.

WROUGHT PIPE.

Prices are very firm and business still continues to improve.

CINCINNATI PIG IRON MARKET.

Reported for IRON TRADE REVIEW by Rogers, Brown & Co.

The pig iron market has been without special feature during the past week. The demand has been fair and the movement of iron on delayed orders unusually heavy. Prices are firm, almost through the entire list. Stocks in nearly all quarters are light and diminishing, though the urgency of dealers to force trade impresses consumers with rather the contrary idea. Southern Coke furnaces have probably 50,000 tons more iron sold than they have made. Of one group of Lake Superior furnaces having not more than 300 tons on hand, the orders actually booked amount to 10,200 tons. In all of the different districts the makers of pig metal are confident that no lower range of prices can be reached, and yet they realize that the market rests upon the foundation of general business and will be largely influenced by developments throughout the country in the next few months. We quote for cash f. o. b. cars Cincinnati (March 24):

Hot Blast Foundry.—Hanging Rock Charcoal, No. 1, $21 50@$23 00; Hanging Rock Charcoal, No. 2, $19 50@22 00; Southern Charcoal, No. 1, $20 00@22 00; Strong Coke, No. 1, $18 50@19 50; Strong Coke, No. 2, $17 50@$18 50; Strong Coke No. 3, $17 00@$18 00; Soft Stone Coal, No. 1, $19 00@$19 50; Soft Stone Coal, No 2, $17 50@$18 50. Forge—Strong Neutral No. 1, mill 16 50@$17 00; Cold Short No 1 mill, $15 50@$16 00 Car Wheel Malleable—Hanging Rock Cold Blast $30 00@$31 00; Hanging Rock Warm Blast $23 00@$26 00; Southern Car Wheel Iron $24 50@$ 6 50; Lake Superior Car Wheel Iron, $24 50@$25 50; Lake Superior Malleable Iron, $24 50@$25 50.

Reported for IRON TRADE REVIEW by E. L. Harper & Co.

There is no change in the market worthy of note. Reliable brands in all grades command quite ready sale at good prices, Foundry Iron especially. It is reasonable to believe that there will be a decided buoyancy in the trade upon the return of settled weather, which seems to have alienated itself from the Ohio Valley. We quote as prices current (March 24):

FOUNDRY.—Hanging Rock Charcoal, No 1, $22 25@$23 25; Hanging Rock Charcoal, No. 2, $21 25@$22 25; Strong Neutral Coke, No. 1, $18 50@$19 00; Strong Neutral Coke, No. 2, $17 50@$18 00; American Scotch, No 1, $19 00@$19 50. GREY FORGE.—Neutral Coke, $16 50@$17 00. Cold Short, $16 25@$16 75; CAR WHEEL AND MALLEABLE—Hanging Rock, Strictly Cold Blast, $27 2[illegible]; Hanging Rock Warm Blast, $24 00@$24 50; Lake Superior, Charcoal all grades $24 00@25 00; Southern Car Wheel Strictly Cold Blast, $26 00@$26 50.

LOUISVILLE PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Geo. H. Hull & Co.

The market for pig iron continues quiet, but firm. The local demand is light, but orders from a distance are coming in with enconraging regularity. The demand for hot blast foundry irons is good. For standard brands of car wheel irons the demand is fully equal to the supply, and some furnaces are largely sold ahead. The demand for car wheel irons not thoroughly well known is light, and quotations for these brands must be regarded as nominal. We quote (March 26):

PIG IRON.—Southern Coke No. 1, Foundry, $18.50@$19.50; Southern Coke No. 2, Foundry, $17.50@ 8.25; Hanging Rock Coke, No. 1, Foundry, $19.50@$20 50; Hanging Rock Charcoal, No. 1, Foundry $22.00@$23.50; Southern Charcoal, No. 1, Foundry, $21.00@$22 00; Silver Grey, different grades, $16 00@18.00; Southern Coke, No 1, Mill, Neutral, $16.00@$17.00; Southern Coke, No. 2, Mill, Neutral, $15.50@$16.00; Southern Coke, No. 1 Mill, Cold Short, $15.50@$16.50; Southern Charcoal, No 1, Mill, $16.00@$19.00; White and Mottled, different grades, $14.50@$15.00; Southern Car Wheel, Standard Brands, $26.00@$27.00; Southern Car Wheel, Other Brands, $22.00@$24.00; Hanging Rock, Cold Blast, $28.00@$30.00; Hanging Rock, Warm Blast, $22.00@$23.50.

CHICAGO PIG IRON MARKET.

Reported for IRON TRADE REVIEW by Pickands, Brown & Co.

The market is quiet, demand being mostly for small lots. We quote (March 25):

Nos 1 & 2 Lake Superior Charcoal, $22 00@$23 00; No. 3 Lake Superior for Car Wheels, $23 00@$24 00; Nos. 4 and 5 Lake Superior for Car Wheels, $21 00@$24 50; No. 1 Scotch, according to brand, $27 00@$28 00; No 1 Hanging Rock, Charcoal, $24 00@$25 00; No. 1 Hanging Rock Coke, $22 00@$23 00; No. 1 Anthracite, $22 00@$23 00; No. 2 Anthracite, $21 00@$22 00; No. 1 American Scotch, $19 00@$22 00.

OILS.

Pure Oils. p'kages included			
Sperm, winter bleached per gal	1 25@1 30	Linseed oil, raw	57@60
Whale, winter bleached per gal	75@80	do do boiled	60@63
Straits	54@57	Cotton seed oil white	50@55
Bank	51@54	do do yellow	49@54
Lard oil extra W S	75@80	West Virginia lubricating 28 deg	12c@13c
do No 1 do	65 @70	Paraffine oil winter pressed	18@25
do No 2 do	60@65	Capitol Cylinder	75
Tallow oil	70@75	Model do	60
Neatsfoot oil pure	95@$1 00	Eldorado Engine	45
do No 1	80@85	Turpentine, per gal	43

COAL,

WHOLESALE.

Wholesale f.o.b. cars at Cleveland:

Carbon Hill and Monday Creek	$2 50	New Hazelton, mix	1 20
Massillon	2 50	" " nut	2 00
Palmyra, lump	3 25	Connotton	2 25
Brier Hill	3 10@3 35	Connotton, mix	1 20
Pittsburgh	3 00	" nut	2 00
Salineville	2 25	Anthracite grate	5 40
Tuscarawas	2 30	Anthracite egg	5 58
New Hazelton	2 50	Anthracite stove	5 85
		Anthracite chestnut	5 98

RETAIL.—Delivered.

Massillon Lump	$3 25	Palmyra, lump	4 25
" Nut	$3 00	New Hazelton	3 50
Carbon Hill and Monday Creek, lump	3 50	Connotton	3 00
Carbon Hill and Monday Creek, nut	3 25	75c less on cars by car load.	
Straitsville, lump	3 25	Anthracite Stove and Chestnut	6 75
Straitsville, nut	2 75	Egg and grate	6 50

Krupp's Fifty Ton Hammer.

American Register.

The fifty-ton hammer with which Krupp belabors his large steel blocks bears the name "Our Fritz." Its stroke on the 1,000 ton anvil, although the latter rests on a chabotte of upwards of 100 square feet in size and is surrounded by water, causes a deafening noise and a concussion resembling an earthquake. The hammer bears the inscription, "Fritz, let fly." This inscription has the following history: When, in 1877, the Emperor William visited the works at Essen this steam hammer attracted his attention.

Alfred Krupp, the father of the present head of the firm presented to the Emperor the machinist, Fritz, who, he said, handled the hammer with such nicety and precision as not to injure or even touch an object placed in the center of the block. The Emperor at once put his diamond studded watch on the spot indicated, and beckoned to the machinist to set the hammer in motion. Master Fritz hesitated out of consideration for the precious article, but the "old gentleman Krupp" urged him on by saying: "Fritz, let fly." Down came the hammer, and the watch remained untouched. The Emperor gave it to the machinist as a souvenir, "old" Krupp added 1,000 marks to the handsome present, and caused the above words to be inscribed on the hammer.

Demands of the Inventors.

At the Inventors' Convention, in Cincinnati, March 26, resolutions were adopted declaring that as much of the progress of the country is the result of inventive genius any material change in the patent laws would be inadvisable. Congress is, therefore, asked to oppose the passage of any bill which would have the effect of discouraging the inventor by impairing the value of patented property, or would impose unequal burdens on the owners of such property in maintaining their rights. They also declare that it is the duty of Congress to provide sufficient clerical force to do the work of the Patent Office well and keep it up to date; to provide a suitable library of scientific works for the use of the Patent Office and inventors; that the Patent Office should be made a department, with a Cabinet officer in charge; that there should be a legal bureau or division in the Patent Office, and that although there have been nearly 300,000 patents drafted, there have been scarcely a score which the public has objected to, and no patent based on wrong which the courts have not finally held invalid.

Cleveland Wholesale Prices.

[The lowest quotable prices are given in all cases.]

HARDWARE.

Adzes.

Carpenter's	per doz $18 40
Ship	" " 18 75
Heavy railroad	" " 19 50

Axes.

	per doz.
James' 2d qual	$7 00
Buckeye	7 75
" doub. bitt	15 00
Hunt's	9 50
Mami's	8 00
Lippincott's Crown	8 50
Cut More	9 00
Peck's Double Bit	22 00
"Champion Blade	11 00
Good triple silver steel	11 50

Axles.

Standard list,
Nos. 1 to 6, 50 & 10 off
Nos. 7 to 14, 50 & 5 off
Nos. 15 to 18, 45 off
Nos. 19 to 22, 50 & 5 off

Anvils.

	per lb.
Eagle, Amer	10c dis 20
Wright's	10¾c@11c
Armitage's Mouse Hole	9¾c@9¾c
Trenton	10½c
Wilkinson's	10½c

Anvil Vise and Drill.

Millers Falls Co. $18 ....dis 20
Cheney Anvil and Vise dis25&2

Augurs and Bits.

C S cut augers .....dis 60
do do do bits.....60
D C gimlet do Ives.. dis 50
Snells bits.....dis 60
Russell Jennings' augers, new list dis 25
Cook's pat augur.....40&10

Animal Pokes.

Akron	$ 3 50
Camp's	4 00
Berea, per doz	4 00
Eagle, per doz	5 00

Apple Parers.

Domestic&Reading ℔ doz.	$7 00
Turn Table	4 50

Axle Grease.

Frazier's, per gross,	$10 00
Common,	6 00

Bolts.

Carriage com, old list	80&20
Tire, common, old list	80&20
Eagle carriage bolts	70
Philadel. " "	75
Stove bolts	50
Plow bolts	40
Machine	75
Cast iron barrel bolts	55&10
Wr't " " "	55&10
Cast iron chain bolts	65&10
Wr't iron sq'r bolts	55&10
Wr't shutter bolts	55&10
Ives' pat. door bolts	50
Sargent's list	
Bolt Ends 16c. per lb. net	75
Cast Iron Barrel Shutter, etc	dis 55&10
Wrought Barrel	dis 55&10
Wrought Square	dis 55&10
Wr'g't Shut'r, all iron, Stanley's list	dis 50&10

Bright Wire Goods.

List June 5th, 1883.....70&10

Bellows.

	Dis
Hill,s	40 pr cent
Bl'ksmith's com new list,50 ct	
Moulder's new list, dis 25 ct	
Hand, new list, 25 per cent	

Butts.

	Dis
Wrought brass	75
Cast, loose joint	60&10
Pin, loose	60&10
Wrought, fast joint narrow	60
Wrought fast joint broad	60
Wrought loose joint broad	60
Wrought table and back flaps	60
Loose joint, without acorns	60

2 per ct. extra dis for cash.

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch.....dis 37½
"National" Standard Gauge 11 inch to 15 inch .... dis 25
"National" Special Locomotive Tubes ....net list

BoilerMakers' Tools.

Doty's Power Shears ..net list
" Hand Lever Shears..net list
" Power Punch.....net list
" Hand Punch .....net list
Steel Screw Punch.....net list
Iron Screw Punch .....net list
Boiler Plate Rolls.....net list
Buffalo Forges& Blowers dis 20
Watson's " " net list
Spring Tube Expander ..dis 15
Roller Tube Expander.net list
National Tube Cleaner .dis 20
Wire Flue Brushes ....net list
Anvils—'Peter Wright' 12½ ℔ lb
Solid Box Vises .. net list

Bag Holders.

Sprengle's Pat, $18.00 per doz 40 per cent. dis.

Charcoal Iron

4½inch, per doz	2 50
5 do do	3 50
6 do do	4 50
7 do do	5 50

Planished Amer. Russia Iron

4½inch per doz	5 00
5 do do	6 50
6 do do	8 50
do do	9 50

Discount 33⅓ per cent

Cleveland Stamped Elbows

Genuine Russia Iron

4½inch, per doz	5 50
5 do do	7 50
6 do do	9 50
7 do do	11 00

Chisels.

Hot and cold cutting	℔ lb 30
Railroad track	30
Machinists	30
Mallet head	50
Tape	50
Packing	50
Stone cutters	50

Crowbars.

Cast steel	℔ lb 5
Iron,steel points	4½

Cutlery, Pocket and Table.

Meriden Cutlery Co., table net
Am. Miller Bros.' Cutlery Co ..... dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co. list net
Aaron Berkenshaw's pocket dis 25
Fram Cutlery Co., table net
Cleveland Cutlery Co...dis 25
Miller Bros., pocket.... 33⅓
Akron Cutlery Co..... dss 45

Coopers' Tools.

Bradley's	dis15@20
Braton's	dis15@20

Chains.

Coil by cask,

3-16	⅜	5-16	⅜	7-16	½
9	7½	6 15	560	5 10	495

Drills and Drill Stocks.

Blacksmiths', each $2.50 dis 10
Blacksmiths', self-feeding, each 7.50 dis 20
Breast, P. S. & W ...dis 20&10

Drawing Knives.

Peck, Stow & Wilcox... dis 70
Witherby's .....dis 65@10
Nobles Mfgr. Co 15
Adjustable handle 20

Emery and Sand Paper.

Regular Numbers	℔ lb 6c
Flour and F. F	℔ lb 4c
B. & A. Emery Paper	dis 35
Sand paper	dis 35

Enameled & Tinned Ware.

Kettles.....dis 50
Sauce Pans.....dis 30
Tinned Sauce Pans..... dis 30

Files.

Parkin File Co ..dis 40 ℔ cent
E.M. Boynton's, new list dis 25
J. & Riley Carr .....4.50 to £.
Johnson & Bro. .....dis 50
Butcher's.....4.50 to £.
Walter Spencer & Co.'s "Diamond"..... 4.50 to £.
Western 40
H. Disston & Sons (new list)..... dis 40 per cent
Heller Bros.' Horse Rasps dis 35
Nicholson..... dis 40
New American..... dis 40
Union File Co ..... dis 40
Dayton File Works 40

Grindstones.

Berea	1@1½ ℔ lb
Ohio	1½@1⅞ ℔ lb
Nova Scotia	1½@1¾ ℔ lb
Lake Huron	1@1½ ℔ lb

Hammers.

Maydole's	dis 15
Cheney's	new list 20&10
Hartford Hammer Co	dis 20
Humason & Beckley	dis 15
Verree	dis 5

Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50 and $1.75,dis25&10
Nelson Tool Works..dis 40&10
Warner & Noble's .....dis 5
Kip's.....dis 30

Hatchets.

Buckeye.....Shingling,
Nos...1, 2, 3,
℔ doz $7 50,$8 00,$8 50,dis 40
Claw,
Nos...1, 2, 3,
℔ doz$8 25,$8 75,$9 25, dis 40
Lathing,
Nos...1, 2, 3,
℔doz $7 50,$8 00,$8 50, dis 40

Hay Knives.

Lightning ....per doz. net $18
Wadsworth 33⅓

Hinges.

Champion double acting spring hinges .....dis. 30
Screw & Strap 6@12 in..... 4c
" " 14 in. & larger 8c
Gravity Locking Blind Hinges, Sargeant & Co. 70&10
Clark & Co.... .....70&10
Strap and T Hinges.....60&10

Locks.

Whipple Mfg Co	60
Norwalk Lo Co	60

Nails.

20 to 60d	$2 60
8 and 9d	25
6 and 7d	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅛ inch	3 00
4d barrel	1 00
1¼ inch barrel nails	1 50
1¼ do do do	1 75
1 do do do	2 50
⅛ do do do	3 00
Cut spikes, all sizes	35
Clinch nails, all sizes	1 75
Casing and box nails	75
Finishing nails,	$1 25
Tobacco nails,	50

Nuts and Washers

Nuts, square	8c off list.
Nuts, hexagon	9c. off list.
Washers	7c off list.

Nuts, Bolts, etc.

Machine Bolts	dis 75
Bolt Ends	dis 75
Boiler Patch Bolts	net list

Picks.

Railroad, 4 to 5 lbs.. doz	$6 60
5 to 6 lbs..	7 20
to 7 lbs..	7 80
7 to 8 lbs.	8 40
Railroad Tamping Pick.. 7 to 8 lbs..doz	10 80
Mill Picks per lb	75c

Planes.

Ohio Tool Co	dis 20
Sciota	dis 25
Bailey's Pat. Adjstbledis	20@10
Sandusky, fancy	dis 15
Buckeye	dis 20
Ogontz	dis 25

Plumbers', Steam and Gas Fitters' Supplies.

Wrought Iron Pipe new list and dis .....
Gas Pipe—
New List ⅛ to 1¼ black 27½ dis galv'd 17½ dis
1¼ and larger black..47½ dis galv'd 32½ dis
MalleableIron Fittings... 25
Grey Iron Fittings ....dis 50
Steam Brass Goods.....dis 55
Water " " .....dis 50
Ludlow Gate Valves ...dis. 20
Register Gauge Cocks net 1 00
Montg'ry Gauge Cocks $1 each
Steam Gauges.....dis. 40
Steam Guages 5 in. net dial per doz 30 00
Scotch Glass Tubes.....dis. 70
Tools..... special.
Duplex Injectors.....net.
Soil Pipe & Fittings,Mott's List.....dis. 30
Sinks, Mott's List.....dis. 25
Copper Bath tubs, sinks, etc.....dis. 25
Galvanized Iron Boilers "Scaifes."..... dis. 50
Marble Slabs, Countersunk net per ft.....$ 1 25

Tinners'Tools & Machines.

Machines(P.S.&W.) ... less 10
Tools (P. S. & W.) ..... " 20

Rivets.

Iron	dis 45
Tinned	dis 45
Copper	dis 40 & 10

Rules.

Stanley..... ....dis. 70 & 10

Shovels and Spades.

Ames' new list, July 1, 1881, ...dis 17½
Old Colony.....dis 17½
Remington's (Lowman's Patent).....dis 30
Bishop .....dis 50
Chisholm.....dis 33⅓
Rowland's .....dis 50
Griffiths... .....dis 50

Screws.

	Dis
Flat head iron or steel [new list] per cent dis.	70
Flat head brass	60
Round head iron or steel	60
Round head brass	50
Brass and Silver capped	40
Japanned, list of Plain Screws	40&10
Coach, patent Gimlet point, list per 100	70
Lag, taper points	70
Bed	10
Machine, flat head, iron. round head, iron	55
Bench, iron	55&10
wood, beech, per doz $3	10
wood, hickory	20&10

Saws.

Disston	dis 20
Disston's Circular	dis 40
Disston's hand panel, rip, &c	dis 20
Boynton's lightning cross cut new list	dis 40
Boynton's circular and mill	dis 40
Boynton's ice	dis 25
Boynton's lightning hand panel and rip	dis 25
Livingston's butcher and kitchen	dis 20
Livington's fra ned wood Nos. 101 102 103 104 105 doz $10 8.50 10 7.50 6.20 net	
Peace circular & mill	dis 40
Peace hand panel and rip	dis 25
Peace band saws, all widths	dis 10

Scales.

Hatch, Counter, No. 171...
℔ doz. $42, dis 45
Union Platform.....$6, dis 45
Fairbanks'..... dis 25
Buffalo Scale Co..... dis 40
Forsyth Scale Co.....dis 30
Howe's..... dis 20&10
Chatlilon's Eureka.....dis 25
Family Universal.....dis 50
Scale Beams.....dis 40&10

Sheet and Tank Rivets.

"Norway."

All sizes.....dis. 15

Boiler Rivets—"Albany" ⅛,¼,11-16,and ⅝ in. diam 4 00.
"Standard" ⅛, ¼, 11 16 and ⅝ inch diameter. 4 00

Sad Irons.

From 4 to 10 lbs...	per lb 3 net
Self-Heating	℔ doz $9 net
" Tailors	℔ doz $18 net
Gleason's Shield and Toilet	dis 25
Mrs. Pott's Irons, double pointed	dis 35
Mrs. Pott'sIrons, square back	dis 35
Enterprise Star Irons	dis 35
Combined Fluter and Sad Iron	℔ doz $15, dis 15

Squares.

	D.s
Steel or iron, case lots	55
Try squares and T bevels	40

Spikes—WROUGHT

All lengths by ⅛ inch	3½c
do do do 5-16	3
do do do ¾, 7-16 & ½ in	2¾

Tacks, Brads, &c.

New List Sept. 1, 1882.

Tinned Swedes tacks	dis 30
" American "	30
Swedes tacks, all kinds	30
American cut tacks	30
Copper tacks and nails	30
Swedes Hungarian nails	35
Gimp and lace tacks	30
" " tin'd	30
Furnishing nails	25
Trunk and clout nails	25
Common and pat. brads	20
Basket nails	20
Brush tacks	20
Leathered carpet tacks	20
Cigar box nails	20
Chair nails	20
Double pointed tacks	40

Extra 10 per cent. on all the above.

Valves.

	Dis.
Jenkins' Patent Gate Valves	35
" " Globe	40
" Standard Packing "	20

Vises.

Solid box	45&50
Solid "Crown" (A. H. Hildick)	40 to 100 ℔ lb, 15c net
Solid, Peter Wright's	15½
Solid, Wilkinson's	14&15
Parallel, Parker's	dis 25
" Simpson	dis 20
" Prentiss	dis 15
Saw Filers, Hopkins'	℔ doz $17.50, dis 10
" Wentworth's	9 00
Cowell Hand Vises	dis 25
Richardson's Vise and Anvil	dis 25

Wrenches.

Coe's genuine	50
Girard Standard	dis 50 & 10
Mechanics' 10 and 10	dis. 50
P. S. & W. Mechanics	dis 50&10
Agricultural	dis 70
Campfield & Sutliff	
Engineer's	50
Mechanics'	60
Agricultural	70

Wringers.

2½ inches Universal	$ 6 00
2 inches Eureka	36 00

Wire. New List.

Brass and Copper	dis 15
Bright & annealed, Nos. 0 @ 18	dis 67½
" " Nos. 19 @ 26	dis 67½
" Nos. 27 @ 36	dis 72½
Coppered Nos.0@18,	dis 62½
Galvanized, Nos. @18, market list,	dis 57½
Tinned, Nos. 0 @ 18,	dis 50@52½
Cast steel	dis 55

Tinned Broom Wire, Nos.

18 @ 20	8c lb.
22 to 22	8½c lb net
Annealed Fence, Nos. 8 and 9	dis 67½
Annealed Grape, Nos. 10 to 14	dis 67½
Galvanized Telegraph, Nos. 7 to 9	6½c lb net
Galvanized Telegraph, Nos 10 to 11	℔ lb 7¼c
Galvanized Telegraph, No. 12	℔ lb 7½c
Fence staples	℔ lb 5½@5¾c
Fence Staples, galvanized,	℔ lb 6½@6¾c
Stubs Steel Wire regular	75 per lb net
Barb Wire, painted	5c
Barb Wire, galvanized	6c
Roebling's Iron and Steel Wire Rope (Roebling List)	dis 15

LEAD.

Amerc'n, ℔ lb	4¼@4½c
Bar, ℔ lb	5½c
Pipe, ℔ lb	5¼c dis 10 per ct
Sheet, ℔ ft	5½c dis 10 per ct
Tin-lined pipe	15c dis 10 per ct
Block	45c.
Chilled Shot	8c

Babbitt Metal.

Genuine, per lb., net	25c
Crescent, "	22c
Extra, "	20c
No. 1 "	15c
No. 2 "	12c
No. 3 "	9c
No. 4 "	5½c

COPPER.

Lake Ingot	15@15¼c
Baltimore	14½@15c
Arizona	14½@15c

TINNER'S STOCK.

Tin.

Banca, per lb.	22½
Straits "	20½c
English "	21½c
Bar "	23c
Spelter	5¾@6c

Tin Plate.

IC 12x12 charcoal	$ 6 25
IC 14x20 do	6 25
IX 14x20 do	8 00
DC 12½x17 do	7 00
DX 12½x17 do	9 00
DXX, 12½x17 do	11 00
DXXX, 12½x17 do.	13 00
IC, 20x28 do	13 00
IX, 20x28 do	17 00
IC, 14x20, Best Roof	5 75
IX, 14x20, do	7 50
IC, 20x28 do	11 75
IX, 20x28 do	15 25
IC, 10x15 Best Coke	5 65

Subject to card discount.

Solder.

Half and Half, in bars	13½
No. 1 do	12
Spelter Solder	12
Fat Planished Sheet Iron [A] per lb	10½c
[B] "	9c

Nos	10	15	21	25
	to 14	20	24 & 26	
Com	3-10	3-30	3-40	3-75
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra.

Zinc.

Sheet, cask	6½c
Sheet, open	6½c

BRASS.

Cash prices for Roll and Sheet Brass For less quantity than 100 lbs. add 3c per lb.

High Bra

All Nos not thinner than No 28, wider than 2 in. not wider than 14 inch 30c
All Nos to No. 28 inclusive, and widths over 14 to 20 in. inclusive 35c
All Nos to No 28, inclusive, and widths over 20 to 30 in. inclusive 38
½c per lb advance on each No above Nos 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at 53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c pr lb. more than High Brass
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal
In Bars 48c
Sawed 51c
Planed or Polished ... 54c

For Slitting.

Metal in width in. to ⅛ in. to No. 28, inclusive, 1c per lb, advance.
Metal, in width 2 in. to 1 in thinner than No 28, 2c per lb advance
Metal, in width ⅛ in to ¼ in thinner than No 28, 5c per lb advance.
Metal ¼ in in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths add 7c per pound.
Sheathing Brazier Copper, Bolts, etc.
All sizes, 16 oz. per sq foot and over. per lb 22c
nd over per lb..... 22c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 22c
Brazier's Copper, 10 oz and 12 oz per sq ft.. per lb 23c
Brazier's Copper lighter than 10 oz per sq ft .. per lb 32c
Circles less than 84 inches in diameter . per lb. 33c
Circles 84 inches in diameter and over ..... per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb 30c
Sheathing Copper, over 12 oz per sq. ft.... per lb. 22c
Bolt Copper..... per lb. 28c
Copper Bottoms per lb. 22c
No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft.

Tinning.

14x48 ..... per sheet 6c
All other size sheets, 2½c per square foot For tinning . th sides, double the above amou..

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 80
1½ to 6 by ⅜ to 1 inch	1 90
1¾ to 6 by 1½ to 1¾ inch	2 20
1¾ & 1¾ by ⅜ to ½	1 90
1 & 1¼ by ⅜ to ¾	2 00
⅜ ¾ and ⅜ by .⅜ to ⅝	2 20

Round and Square.

1 to 1½ inch	1 80
2 to 2⅝	2 00
2⅝ to 3⅛	2 30
3⅛ to 4	2 80
4⅛ to 4½	3 30
4⅝ to 5	3 50

Oval.

⅜ to 1¼ inch	2.20
½ to ¾	2.40
⅝	2.60
¾	3 00

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	2 00
1 to 1¾ by ¼ and 5-16 do	2 10
⅝ to ⅞ by ¼ and 5-16 do	2 30
⅝ to ⅞ by ⅜ and 5-16 do	2 80

Half Oval and Half Round.

1¼ to 3 inch	2.9
⅞ to 1¼	2.30
½ to ¾	5.00
⅝	3.30
¾	4.80

Light Band.

1¼ to 6 by ⅛ to 3-16..... 2 30

Hoops.

1¼ to 4, Nos. 13 to 15	2 60
1¼ to 2 , Nos 16 to 18	2 70
1¼ to 4 do 13 to 15	2 80

1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	2 85
No 25 to 26	3 25
No 27	3 40
No 28	3 80

English Steel.

Best cast	℔ lb 16c
Extra cast	16¾c
Round machinery	16c
Swaged, cast	18c
Best double shear	15¾c
Blister, 1st quality	13c
Refined tool steel	16¾c
Spring calking	7¾@7¾c
German steel, best	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15¾c
2d quality	14¾c
3d quality	13¾c

American Steel.

Best brands of refined cast steel, ⅜ to 2 inches	12c
Crucible cast	7c
Open-hearth ditto	4¾c
Hammer cast steel	9c
Spring cast steel	8c
Bessemer and open-hearth spring	4¾c
Ditto plow	3¾c
Bessemer machinery	5 @6c
Spring and calking	7¾@7c
Tire	4
Sleigh shoe	4

Bessemer Steel Tire.

⅜ to 1 by 3-32	3½ ℔ lb
⅜ to 1 by ⅜ to 5-32	3¾ ℔ lb
⅜ to 1 by 3-16 to ⅜	3¾ ℔ lb

Boiler Plates.

"Paxton"—Standard Quality.

C. No. 1	3 00
C. H. No. 1 Sheil	3 50
C. H. No. 1, 50,000	4 00
C. H. No. 1 Flange	4 50
Extra Heavy	5 00

Homo. Steel 70,000 ..... 8 50
Heads, ¼c ℔ lb. extra.
Boiler Tubes. 47½ per cent dis
Burden Rivets 3 75

Miscellaneous Cast Steel.

Auger and auger bit	10
Axle steel for wagons	7
Frog points and plates	8
Frog size bars	8
Pick, hammered	10¾
Mattock, beveled	9
Table cutlery	7¾
Trap spring steel	10
Pike and cant hook	8¾
Coal and granite	9

SCRAP IRON AND OLD METAL.

DEALER'S BUYING PRICES

	Per Ton
No. 1 h R wro't scrap	$19
No. 1 wrought scrap	17
No. 1 Machine cast scrap	14
Stove plate (free from burnt iron)	11 00
Grate bars	8 50
Pipes and flues (clean)	15
Tank iron	14
Hoop and band iron	10
Light sheet iron	9
Axle turnings	15 00@16 00
Wro't turning (f from cast)	13
Wro't iron, oily drillings	9@10
Cast borings	9 00
Malleable iron	8 00
Uncut wro't iron boilers	15
Old copper per lb	10¾
No. 1 H. Brass per lb	11
Heavy yellow Brass do	9@10
Light Brass per lb	7@9
Scrap Zinc per lb	2@3
Tea Lead per lb	3
Heavy Lead per lb	4
Rails	22

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe

	Inside Diameter. Inches.	Weight Per Foot.	Price Per Foot Black.	Price Per Foot Galvan'd
Butt-Welded.	⅛	.24	08	
	¼	.42	03	$0 05
	⅜	.56	03½	0 05½
	½	.84	01¾	0 06
	¾	1.12	06	0 07½
	1	1.67	08	0 10½
	1¼	2.24	11	0 14
Lap-Welded.	1¼	2 68	21	0 24
	2	3.61	26	0 30
	2½	5.74	38	0 47
	3	7 54	50	0 62
	3½	9 00	67	0 86
	4	10.66	83	1 00
	4½	12 34	1.00	1 26
	5	14 50	1.10	1 70
	6	18 76	1 50	2 00
	7	23.27	2 00	
	8	28 18	2.75	
	9	33 70	3 70	
	10	40 06	4.75	
	11	45 02	5 75	
	12	49.00	6 50	
	13	54.00	7 75	
	14	38 00	9 00	
	15		10.00	

Discount, (car load lots) butt-welded ⅜ inch to 1½ inches plain .....30 per cent.
Ditto galvanized 20 per cent.
Discounts (car load lots) lap-welded 1½ inches to 15 in. plain ..... 50 per cent.
Ditto galvanized 35 per cent.
Discounts on less than car lots 2½ per cent. less.
Discounts on pipe cut to specified lengths depends on size and waste.

Some Bessemer Steel Outputs.

Chicago Journal of Commerce.

When the Bessemer converters were first placed in operation 40 tons a day was considered the utmost capacity of the plant, today the capacity of a model steel plant with direct processes and all modern appliances is something almost startling. Instead of 40 tons 750 to 1,000 tons a day is a average of commou occurrence. The South Chicago steel plant is rolling an average of 6,500 rails a day, giving an output of 750 tons with two converters, three blast furnaces and a cupola. This is about three-fourths capacity of the plant were the other furnace and converter at work. The con verters are ten-ton, and with three of them two may be blown at the same time as is frequently done, and in the system of dispensing with roughing train and rolling a four length rail, the ingot is kept hot while the capacity of the rail mill engine is such that two rails may be rolled at the same time. The rail mill is reversing, and runs so rapidly that a four-length rail is rolled in one and one-half minute in 7 passes and reverses, and when running perfectly the rails have been sawed at the rate of four a min ute. It is only by this improved process and appliances and great product that rails can be furnished at the present low prices of $37.50 per ton.

During one day turn of 12 hours last week the product of the South Chicago plant of the North Chicago Rolling mill company was exactly two rails a minute for the twelve hours.

Shoveling up the Chimney.

American Journal of Railway Appliances.

It is funny to see how a little stoker can fire coal clear out of the chimney. That is, he does the same thing. He scoops and dumps, and cleans his fire twice a day; and it takes a two-horse team to haul coal fast enough to keep him busy.

You can't teach that little fellow anything about firing; not even when you show him that you could run a brick yard on the ash and droppings from his grates, and melt brass at times, in the mouth of his stack. He is a shoveler, not a fireman, nor even a stoker. He is guarauteed to reduce the most solid bank account at the rate of two dollars a day, and not half try. He only gets nine to twelve dollars a week, and does his own repairs, and runs the engine, and mends the belts, and lines the shafting, and packs the heating coil valves, and lends a hand generally; but his principal duty is firing coal and money up the stack.

There are lots of him. You know him, and most of you lose by him, directly or indirectly.

How Solid Emery Wheels are Made.

Boston Commercial Bulletin:

The three following processes cover all the methods yet successfully applied in the production of solid emery wheels:

1. Vitrification.—This consists in mixing the emery, or corundum with feldspar sand, or some species of clay, and, when formed to proper shape, putting the same, (by various processes,) in contact with heat, at a temperature sufficient to melt or flux the bond, thereby holding together the grains of emery.

2d. The tamping process. By this method, various chemical agents which have an affinity for each other and for the emery are mixed with the emery, and by the use of hammers and tamping irons or hydraulic presses, the mass is formed in dies to the shape and size required. Some of these processes employ a moderate heat to dry the mass, some require a cool, dry atmosphere.

3d. Wheels made by pressing together glues, cements, rubber, celluloid, asbestos, etc., etc., while hot, or heated to the melting point.

To Centre an Engine.

Steam.

Move the engine by the fly-wheel toward the end on which you wish to centre it, till the cross-head is near the end of its travel, and mark the slide even with the end of the cross-head, and then with the surface gauge, or any fixed point, make a mark on the fly-wheel rim, crank disc, shaft, or any finished revolving part, pry the engine past the centre and till the cross-head passes the mark on the slide, then pry back again till the cross-head agrees exactly with the mark on the slide. This last, in order to have all lost motion in connecting rod taken in same direction both times. With engine in present position make another mark on the revolving part first selected. With a pair of dividers bisect the distance between these marks and prick-punch the spot. Pry the engine around until this point coincides with the points of your surface gauge and the crank is absolutely on the dead centre, if the axis of the piston rod and axis of shaft are in the same plane, as they should be.

"Water" as a Lubricator.

Saw Mill Gazette.

The latest novelty in lubricators is announced by German papers in the form of "water." Owing to its low price it can compete successfully with every other lubricator yet discovered, but it has one disadvantage, all metal bearings must be replaced by bearings made of parchment paper. The advantage of such application is said to consist not only in the small cost of the lubricator, but also in the durability of the material, as parchment paper, moistened and pressed into blocks, forms a very resisting, homogeneous and solid, but withal slippery mass, which offers a minimum of friction to a smooth metal axis, and is subjected to a very small amount of wear and tear. A small portion of oil is rubbed on the surface before use to prevent any rusting of the metal.—[Ex.

An Easy Test for Lubricants.

The manager of any mill may, at very little expense, determine for himself all the conditions of safety and economy in lubricants as indicated by the standard of heat developed upon any given shaft. The apparatus required for this purpose is merely a thin brass tube closed at the lower end, and two thermometers. The method of using this apparatus is as follows: Place enough water in one of these tubes so that the bulb of the thermometer will be immersed; insert the tube in one of the holes in the cap of the journal, so that the lower end of the tube will be in actual contact with the shaft, hang the other thermometer free along side, then gauge the relative heat developed with oils and with greases. Each man may thus satisfy himself as to which is best and safest.

New "Blue Copy" Process.

Mr. T. O. Perkins, City Engineer of Somerville, Mass., writes the Engineering News as follows: I have lately discovered that white lines and letters may be made on a finished "blue copy," by using, as one would use ink, a solution of chloride of lime in water. Samples of lines and letters put on by this method are enclosed herewith. The solution was made by mixing the chloride with about an equal quantity of water, shaking it, and allowing it to stand a few hours before using. It was applied with a drawing or writing pen, and allowed to stand till dry. The sheet was then thoroughly washed in water, the blue color washing off wherever the solution had covered it, and exposing the white surface of the paper. The solution is also useful for erasing lines or figures in carmine, and in some writing inks.

Marking Countershaft Speeds.

American Journal of Railway Appliances.

Suppose you relieve people of the risk of mistakes, owing to the uncertainty as to how fast a countershaft should run, by marking the proper speed, or range of speed, on the shaft end. Where shafts are already up, mark how fast they ought to run, without allowing for belt slip, and how fast they do run when well belted.

PRESSURE without motion is not power, and the object pressed does not consume power, as long as it does not move. Thus you see this is not the reason why we do not obtain the full mechanical equivalent of the fuel. Attempts have often been made by parties who did not understand this, to utilize the pressure on the piston head, by means of two pistons, letting the steam enter between them; but of course with no beneficial results whatever, except that a small balanced engine was the result, in which the momentum of one piston was balanced by the motion of the other in an opposite direction, so that it could be run at a very high speed without being shaken.—[Ex.

A Question For Engineers.

Boston Manufacturers Gazette.

In the "Engineers' Column" will be found a letter from "Injector," asking a question as follows: "Is there any vacuum gained by the use of the heater?" Of course this question refers to the use of the heater for feed water between the cylinder and condenser. Of ourselves we have no definite data. This will give the engineers a chance to show whatever they may know regarding it, and if any of them have authentic record of any experiments, we really hope they will give it to us.

We would like similar answers.—Ed.]

THE English Mechanic says: "Although the average speed of trains in the United States is 20 per cent. below the mean speed of trains in this country, all things considered, the service controlled by the American engineers compares favorably with any in the world. The American engineers at first copied English builders and made locomotives with single drivers; but, as is their wont, they quickly made improvements, and we are not disposed to dispute with Mr. Edwards the dictum that the American locomotive of to-day is 'one of the most perfect pieces of mechanism wrought out by the hand and mind of man.'"

STEEL belting is, according to report, now being made in Germany. The belts are made exclusively of steel wire, and are so constructed that they are flexible, easily fastened, and may be tightened at pleasure. The pulley upon which the belting runs must be covered with leather or other suitable material for securing the necessary amount of adhesion. The belting is well adapted for heavy work, it is claimed, and is not affected by dampness or a change of temperature, as is leather.

A REMARKABLE small steam engine was exhibited at the Vienna Electrical Exhibition by Mr. Whitehead, of torpedo fame. The whole thing was only about five inches high by ten inches diameter; it was able to work with 2½ to 3 horse power and give motion to a dynamo for the production of twenty-five incandescent lights of sixteen candle power each. The whole apparatus, steam engine, boiler and electrical machine, can be packed in a box 40 inches long, 26 inches wide and 13 inches high.

IT is asserted that articles of iron or brass may be bronzed by dipping them into melted sulphur mixed with lampblack. The surface, after being drained off, will take a beautiful polish, and presents the appearance of oxidized bronze.

To whiten small articles made of brass or copper, boil them in three quarters of a pound of cream tartar, and one pound grain tin or any pure tin finely divided. The tin dissolves in the cream of tartar, and is precipitated on the brass or copper.

PROF. HUXLEY urges the necessity of combining skill in handwork with technical knowledge. In England, there are already 150 centres for technological education and examination, with 3,000 examiners; the system being only six years old.

THE natural steel of Germany is made directly from the ore, and sometimes from pig iron in the Catalan forge.

STEEL in India is made by melting the crude, native iron in crucibles, in which pieces of wood or leaves are introduced.

BAIRD FURNACE, belonging to the Baird Iron Co., is now the only furnace in blast in the Hocking Valley region in Ohio.

THE name of the "Pittsburgh" furnace, at Pittsburgh, has been changed to the "Carrie."

WARNER'S furnace at Tecumseh, Ala., made in the month of January 1,215 tons of pig iron.

FOUNDRY
FOR SALE.

A FOUNDRY with all necessary machinery, flasks, patterns, and full equimpments for general foundry business; also japaning ovens, and a complete nickel, copper and silver plating department with Brush electro plating machine; all in first class order; will be sold at a bargaian. Apply at 74 Euclid ave. or in the evening at 1048 Wilson ave., Cleveland, O. 01

FOR SALE—A large and well selected stock of marbleized slate mantels and grates of various styles; also brass open fireplaces, fenders, andirons, etc., and a fine assortment of tiles, eombining Low's art tiles. English figured and plain tiles will be sold cheap if taken before April 1. Apply at 74 Euclid ave. or in the evening at 1048 Wilson ave., Cleveland, O.

FOR SALE.
MALLEABLE IRON WORKS

of Akron. Two large Annealing Ovens with equipments for same; Japanning and Tinning Rooms; good Boiler and Engine of 25-horse power; machine and store house two stories, 33x50 feet, containing pulleys, hangings, benches, polishing barrels, etc.; Moulding Foundry 50x70 feet, including cupola, ladles, crane, core-oven and air-furnace with a fine high stack.

Four buildings and one acre of ground well located. Shipping facilities the very best. Buildings and machinery all nearly new. The whole will be sold at a bargain and on reasonable terms of payment. Enquire of A. B. TINKER, at Buchtel College.

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THE CAR WHEEL FOUNDRY on C. & P. Railroad, cor. Lake and Wasson streets, with engine, boiler, patterns, tools, side tracks and lot 120x467.
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Eligibly situated for manufacturing purposes, on and near the N. Y., P. & O., the C. C. C. & I., and the Lake Shore Railroads at Cleveland.
J. H. SARGENT,
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FOR RENT.

FOR RENT, with or without power, 3-story BRICK FACTORY, corner Columbus and Winter streets. Inquire of PETER GERLACH & CO.,
31 51 Centre street, Cleveland, O.

WANTED.

AN EXPERIENCED Mechanical Engineer desires an engagement with an enterprising firm, with a view of introducing and manufacturing a line of machinery for which there is a large and growing demand with good profit. First class references given. Address J. M., care Iron Trade Review.
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TO BUY A ONE HORSE POWER ENGINE. Must be cheap. Address CHAS. SMITH,
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tf Care Trade Review, Cleveland, O.

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WANTED—PARTNER in two or three good paying manufacturing businesses. For particulars address F. H. & Co., care Trade Review.

FOR SALE, a fine piece of property on Jennings Avenue, of 500 feet, near the Nickel Plate Railroad. Well located for building or manufacturing purposes. We will sell this at a bargain, and invite a call.
A. D. MORTON & SON,
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FOR SALE.—A first class medium CIRCULAR SAW MILL, new, never been used. Will be sold cheap. Address M. & Co., care Trade Review. 51-tf

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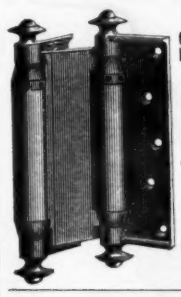

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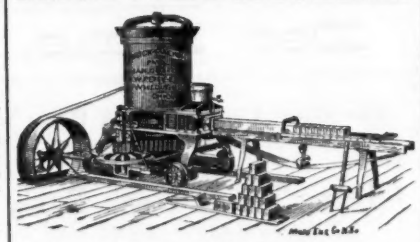

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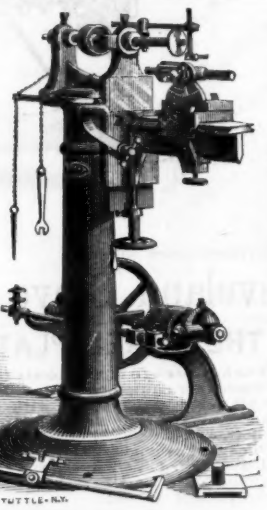

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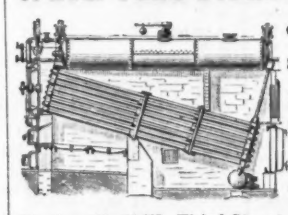

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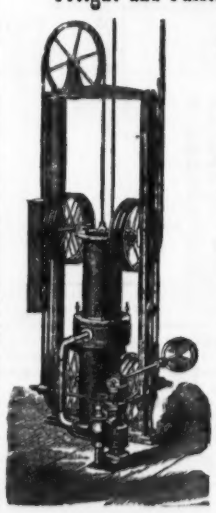

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In effect November 18, 1883, based on Central Standard Time.

GOING NORTH.

STATIONS.	No. 1.	No. 3.	No. 5.	No. 7.
Leave Columbus	6 45	11 40	.....	16 50
Westerville	7 10	12 05	.....	17 18
Centerburg	7 52	12 47	.....	18 04
Mt. Vernon	8 37 B	13 31 D	.....	18 50 S
Gambier	8 49	13 41	.....	19 01
Danville	9 09	14 01	.....	19 23
Gann	9 21	14 11	.....	19 35
Millersburg	10 14	14 59	5 30am	.....
Fredricksb'g	10 37	15 19	5 51	.....
Orrville	11 12	15 50	6 50 B	.....
Warwick	11 36	16 11	7 16	.....
Clinton	11 42	16 16	7 23	.....
Akron	12 15	16 46	7 57	.....
C'yahoga F'a	12 30	16 58	8 11	.....
Hudson	12 50	17 15	8 30	.....
Ar. Clevel'd	14 12	18 25	9 50	.....

GOING SOUTH.

	No. 2	No. 4.	No. 6.	No. 10.
Leave. Cleveland	8 00	14 00	15 15	16 50
Hudson	9 17	15 10	16 30	18 15.
Cuyahoga F's.	9 35	15 28	16 54	18 50
Akron	9 51	15 44	17 11	19 45
Clinton	10 22	16 16	17 43	.....
Warwick	10 26	16 21	17 48	.....
Orrville	10 51	16 47	18 14	.....
Fredrickaburg	11 22	17 18	18 48	.....
Millersburg	11 45	17 40	19 10	No. 8.
Gann	12 32	18 30	.....	5 50
Danville	12 44	18 41	.....	6 0
Gambier	13 04	19 01	.....	6 21
Mt. Vernon	13 29 D	19 26 S	.....	6 50 B
Centerburg	14 01	20 00	.....	7 25
Westerville	14 45	20 45	.....	8 13
Columbus arr.	15 10	21 10	.....	8 40

The system used in the above table consists in avoiding the confusing division of the day into two equal portions of 12 hours each, and employing instead a continuous count from 1 to 24. The days begins at Midnight, as under the common system, but there is no possibility of confusion between the forenoon and afternoon hours.
E. T. AFFLECK,
Gen. Pass. Ag't, Columbus, O.
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2:20 P.M. LIMITED EXPRESS, Pullman (daily). Sleeper Cleveland to New York, Arrives at Meadville, 6:30 p.m.; Jamestown, 8:47 p.m.; Salamanca, 9:45 p.m.; New York, 10:10 a.m.

11:00 P.M. NIGHT EXPRESS, (daily except Sunday), Sleeping Coach from Leavittsurg to New York without change. Arrives at Youngstown, 1:50 a.m.; Pittsburgh, 5:50 a.m.; Washington 0:00 a.m. Baltimore 00:00 p.m.; Meadville, 3:25 a.m. Corry, 4:59 a.m.; Jamestown, 5:57 a.m.; Buffalo, 9:20 a.m.; Rochester, 12:58 p.m.; Hornellsville 11:00 a.m.; Corning, 12:07 p.m.; Elmira 12:40 p.m.; Binghampton, 2:19 p.m.; New York 9:10 p.m.

2:20 P.M. PITTSBURGH EXPRESS, daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:02 p.m.; Washington, 7:00 a.m.; Baltimore, 8:19 a.m.

4:10 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 6:55 p.m; Sharon, 8:01 p.m; Sharpsville 8:10 p.m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m. Pittsburgh, 00:00 p.m.

6:50 A.M. PITTSBURGH EXPRESS, —(daily) through without change. Arrives at Youngstown, 9:30 a.m.; Sharon, 10:30 a.m.; Sharpsville, 10:40 a.m.; Pittsburgh, 12:45 p.m. Returning, leave Pittsburgh, 4:15 a.m., 7:45 a.m., and 12:55 p.m. and 3:45 p.m.

10:35 A.M. YOUNGSTOWN & PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 1:30 p.m.; Pittsburgh, 5:45 p.m. Trains arrive at Cleveland, 6:15 a.m., 6:30 p.m., 10:30 a.m. 1:05 p.m., and 9:45 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East.

☞ Through Tickets and information regarding the route can be obtained at the office 131 Bank street, and at new Depot of New York, Pennsylvania and Ohio Railway, South Water street and Viaduct, Cleveland.

A. E. CLARK,
Gen. Pa Agt., Cleveland, Ohio.
J. M. FERRIS, Gen. Man'gr, Cleveland.
M. L. FOUTS, Pass. Agt., 131 Bank st., Cleveland.

TRAVELER'S REGISTER.

Lake Shore & Michigan Southern.

The time given is the new standard (Ninetieth meridian) time, which is thirty-three (33) minutes slower than Cleveland time.

TRAINS GOING EAST.	Arrive. From West.	Depart. For East
Fast N. Y. Express	*1 07 a m	*1 22 a m
N.Y.,Bo't'n & At. Ex.	*6 37 a m	*7 02 a m
Elyria Accommodation	‡8 07 a m	.....
Pt.Clinton Accomd'at'n	‡10 37 a m	.....
Buffalo Accommodation	‡10 37 a m	‡10 52 a m
N. Y and B't'n Fast Ex.	*1 57 p m	*2 27 p m
Cincinnati and St Louis Ex	.....	3 27 p m
Conneaut Accom'dation	.....	‡4 22 p m
Night Exp via Norwalk	‡ 9 42 p m	‡10 07 p m
Night Exp via San'sky	9 44 p m	.....
TRAINS GOING WEST.	**Arrive. From East.**	**Depart. For West.**
Fast Limited Express	*11 55 a m	*12 05 a m
Mich. Ex. via Sandusky	*2 22 a m	*2 37 a m
Chi. Ex. via Sandusky	‡6 07 a m	6 32 a m
Mich. Ac. via Norwalk	.....	‡6 12 a m
Conneaut Accom'dat'n	‡8 12 a m	.....
Toledo Ex. via Norwalk	‡12 52 p m	‡3 02 p m
St. Louis Ex. via San'ky	*1 02 p m	*1 25 p m
Chi. Pac.Ex. via Nor'lk.	*6 02 p m	*6 32 p m
Pt.Clinton Accom'dat'n	.....	‡4 32 p m

Sunday trains for Nottingham—Depart 8:32 a. m. and 1:47 p. m., return at 9:37 a. m. and 4:17 p. m.

Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.

Cleveland, Columbus Cincinnati & Indianapolis.

Central standard time, 33 minutes slower than Cleveland time.

ARRIVALS.	
No. 2 Col. & Cin. & Ind'polis Ex.	*6 45 A.M
No. 8 C. L. & W and Galion Exp	9 10
No. 12 St. Louis & New York Exp.	*2 50 P.M
No 6 Indianapolis & Columbus Exp	9 55
No 4 Columbus & Cincinnati Exp.	*8 20
No. 10 Wheeling Express	6 45
No. 14 Cincin New York fast line,	1 10 A.M
DEPARTURES.	
No. 1 Cincinnati & Columbus Exp.	*7 30 A.M
No. 11 Cleve, Indianap.&Wheel'g Ex	6 40
No. 3 Special St. Louis & Cin. Ex.	**1 40 P.M
No. 5 Night Express,	*6 40
No. 7 C. L. & W. and Galion Exp	4 30
No. 17 Spec. Col. Cin'ti. Exp	1 20

**This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland & Pittsburgh.

The time given is the central standard time, thirty-three minutes slower than Cleveland time.

	DEPART	ARRIVE
Pittsburg & Wheeling	8 00 A.M	2 12 P.M
Express	2 00 P.M	6 25
Alliance Accommodation	3 15	9 50 A.M
Ravenna Accommoda	4 50	8 12
Night Express	‡11 10 P.M	5 55 A.M
Newburg Accom'dation	10 30 A.M	11 40
Newburg Accom'dation	12 00 M.	1 20 P.M

‡ Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance. All other trains daily except Sunday.

"The Nickel Plate."

Ninetieth meridian time.

Going East.	ARRIVE.	DEPART
Buffalo Accom	10 22 a.m.	10 27 a.m.
Conneaut Accom		3 52 p.m.
Chicago Accom	9 02 p.m.	
Local Freight	11 36 p.m.	12 17 p.m.
Going West.	ARRIVE.	DEPART.
Chicago Accom		6 47 a.m.
Conneaut Accom	8 57 a.m.	
Bellevue Accom	4 52 p.m.	4 57 p.m.
Local Freight	12 44 p.m.	1 22 p.m.

Rocky River Accommodation departs 5 52 a.m.; 1 47 p.m.

Euclid Accommodation departs 7 02 a.m.; 11 42 p.m., 5 17 p.m.

All trains daily except Sunday.

New York, Pennsylvania & Ohio.

New standard central, or Ninetieth meridian time, 33 minutes slower than Cleveland city time.

DEPARTURES.	a.m.	p.m.
N. Y. & Pitts. Express	* 6 50	11 00
Youngstown & Pitts. Ac	10 35	.....
Fast N. Y. & Pitts. Express		* 2 30
Mahoning Accommodation		4 10
N. Y. and Pitts. Express		11 00
ARRIVALS.	a.m.	p.m.
New York Express	* 6 15	.....
Mahoning Valley Ac	10 20	.....
Fast N. Y. & Pitts. Ex		* 1 05
N. Y. & Pittsburgh Ex		* 6 30
Youngstown & Pitts. Ac		9 45

* Sunday trains.

Valley Railway.

Central Standard time.

	ARRIVE.	DEPART
Wheeling Junction	9 47 A.M	8 02 A.M
Canton	1 48 P.M	5 47 P.M
Wheeling Junction	5 47 P.M	2 52 P.M

Special trains leave on Sunday at 3.50 P.M., arriving at Cleveland at 6.42 P. M.

Depot foot of South Water Street.

Connotton Valley Railway.

Standard Time.

Trains arrive:	A. M.	P. M.
Canton, Sherrodsville & Coshc'ton	9 47	7 07
Canton & Coshocton		1 02
Kent accommodation	7 37	

Newburgh 7:02 a. m., 8:32 a. m. 1:52 p. m., 4:17 p.m., 6:42 p. m., 10:07 p.m.

Trains leave Cleveland,	A. M.	P. M.
Canton, Coshocton & Sherrodsville	7 02	
Canton & Sherrodsville		2 07
Canton & Coshocton	7 02	3 42
Kent accommodation		5 12

Cleveland and Newburgh, 6:12 a. m., 7:47 a.m., 10:32 a m., 2:52 p.m., 5:52 p.m., 5:12 p.m.

Newburgh and Bedford 10:32 p.m.

Trains Sunday only depart for Bedford 8:07 p.m., 10:07 a.m., 9:02 p.m.; Newburgh, 1:42 p m.; Kent Accommodation 5:12 p.m.

Trains arrive, Kent Accommodation 7:37 p.m. Bedford 8:45 p.m., 1:27 p m., 5:55 p.m.; Newburgh 2:32.

Depot corner Huron and Ontario streets.

Cleveland, Akron & Columbus Railroad.

Cleveland, Akron & Columbus Railroad, running over Cleveland & Pittsburgh Rail road to Hudson, for Akron, Columbus, etc.

	ARRIVE.	DEPART.
Mail	2 30 P.M	8 25 A.M
Express	7 30	2 00 P.M
Accommodation	10 10 A.M	3 45 P.M

Cleveland, Lorain & Wheeling.

ARRIVALS.	
Wheeling & Cleveland Express	7 15 P.M
Uhrichsville Express	9 30 A.M
DEPARTURES.	
Wheeling & Cleveland Express	7 10 A.M
Uhrichsville Express	5 00 P.M

DEAD-STROKE

Power Hammers.

Construction Improved. Seven Sizes. 5 to 250 Pounds. Over 600 in Use. Price reduced March 1st.

The 15 and 25 pound sizes are specially adapted for Filemakers' use, the other sizes for general forging. Send for circular and references.

DIENELT & EISENHARDT,

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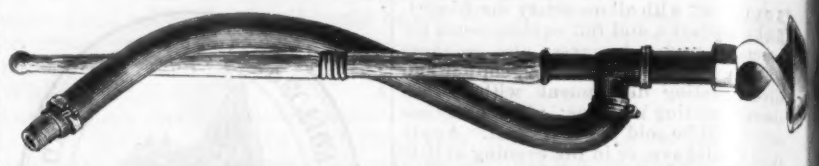
1306 Howard Street, Philadelphia.

The Cyclone Boiler Flue Cleaner,

Gerlach's pat. June 5, 1883.



The auger shaped steam passage gives the steam a spiral motion the entire length of tubes, thoroughly cleaning a set of tubes in 5 minutes.

Improving the draft, saving fuel and labor

No steam user should be without one.

Circulars free, liberal discount to dealers.

CRESCENT MANUFACTURING CO

5 Michigan street, Cleveland, O.

93

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The most successful operating Stove offered to the trade.

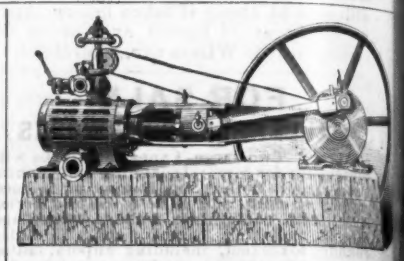
The simplest, most durable and most economical Stove on the market.

Three Burners supplied with Gas from one Generator.

No Needle Valves.
No Jamb-Nuts.
No Stuffing Boxes.
No threads in contact with the Gasoline.

Correspondence solicited.

Cleveland Stove Co, Cleveland, O. Sole Manufacturers.



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Engines from 15 to 400 Horse Power

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THE NICKEL PLATE.

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The passenger equipment of new trunk line is all new and is supplied with the latest appliances necessary to safe, speedy and comfortable travel.

At Chicago, Passenger Trains arrive at and leave Union Depot, Van Buren street.

Following is the time in effect Nov. 18, 1883, and until further notice:

GOING EAST.

	Local Pass'n'gr	Local Pass'ngr.	Conneaut. Accom.
Lv. Chicago	7 47 am	....	.....
Ar. Valparaiso	9 37	.....	.....
" Ft. Wayne	1 00 pm	.....	.....
" New Haven	1 35	.....	.....
" West Leipsic	3 45	.....	.....
" Arcadia	4 44	.....	.....
" Fostoria	4 57	.....	.....
" Gr. Springs.	5 44	.....	.....
" Bellevue	6 12	.....	.....
Lv Bellevue	6 22	7 52 am	.....
Ar Lorain	7 50	9 16	.....
Ar Cleveland	9 02 pm	10 22	.....
Lv Cleveland	.....	10 27	3 52 pm
Ar Painesville	.....	11 33	5 05
" Ashtabula	.....	12 25 pm	6 03
" Conneaut	.....	1 07	6 32
" Erie	.....	2 09	.....
" Dunkirk	.....	3 47	.....
" Buffalo	.....	5 22	.....

GOING WEST.

	Local Passn'gr.	Local Pass'ngr.	Con'eaut Accom.
Lv Buffalo	.....	9 47 am	.....
Ar Dunkirk	.....	11 24	.....
" Erie	.....	1 33 pm	Leave.
" Conneaut	.....	2 17	6 17 am
" Ashtabula	.....	2 50	6 46
" Painesville	.....	3 44	7 43
" Cleveland	.....	4 52	8 57
Lv Cleveland	6 47 am	4 57	.....
Ar Lorain	7 53	6 12	.....
Ar Bellevue	9 17	7 37	.....
Lv Bellevue	9 22	.....	.....
Ar Gr. Springs	9 44	.....	.....
" Fostoria	10 22	.....	.....
" Arcadia	10 34	.....	.....
" West Leipsic	11 30	.....	.....
" New Haven	1 35 pm	.....	.....
" Ft Wayne	1 52	.....	.....
" Valparaiso	5 55	.....	.....
" Chicago	7 52	.....	.....

Trains run by Ninetieth meridian time, which is nine minutes slower than Chicago time, twenty-eight minutes slower than Columbus time, thirty-three minutes slower than Cleveland time, forty-four minutes slower than Buffalo city time, and sixty minutes slower than Seventy-fifth meridian time.

For information, call on nearest Agent of the Company or address

B. F. HORNER,
Gen'l Passenger Agent.

LEWIS WILLIAMS,
General Manager, Cleveland O.

Bee Line.

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Three Trains Week Days,

TWO TRAINS SUNDAY.

Leave Cleveland with Through Palace Coaches and Elegant Sleeping Cars for

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Without Change.

This is the only line making Direct Connection with all the principal Trunk Lines of the East for all Southern, Southwestern and Western points, either by way of Cincinnati, Indianapolis or St. Louis for all railway towns in Missouri, Arkansas, Texas, Kansas, Nebraska, Colorado, New Mexico, Old Mexico and the Pacific Coast.

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A. J. Smith, Gen'l Pass. Agent, CLEVELAND, O.

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The best in the market

FOR WET AND DRY GRINDING,

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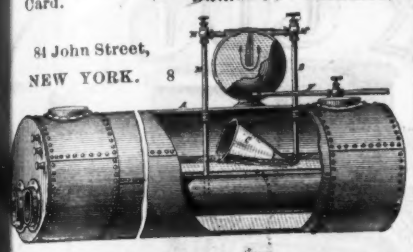

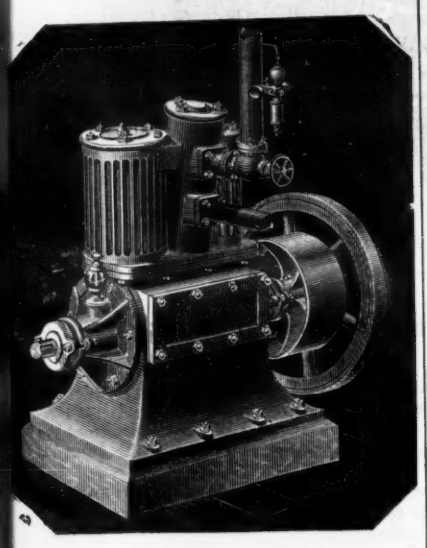

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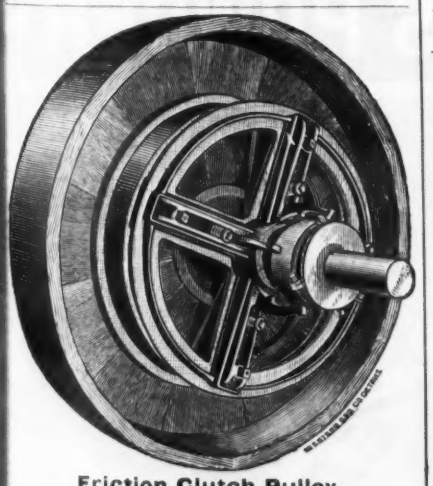

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Taper Sleeve Pulley Works.

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JACKSON IRON CO. Iron Ore and Pig Iron. Fayette Brown, Gen. Agent. 101 St. Clair street. 15

RHODES & CO. Coal, Iron Ore and Pig Iron. 101 St. Clair street. 1

DALLIBA, J. H., Iron Ore. Grand Arcade Building, 101 St Clair st. 51

BABCOCK, MORRIS & CO., —COAL.— Grand Arcade Building, Cleveland, O. 5

Carriage Bolts.

THE COLWELL & COLLINS NORWAY BOLT CO., manufacturers of Philadelphia Carriage and Tire Bolts. 41

Carriage Repository.

GREENE'S, J. O., Carriage Repository, 408 Superior street and 52, 54 & 56 Rockwell street, dealer in Fine Carriages. Repair shop in connection. 41

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BOWLER & CO., Car Wheels, Patent Chilled Frogs, and all kinds of castings. 9 Winter.

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FITZSIMONS WM. & SON, Rolling Mill and Machinery castings. Rolls a Specialty. No. 435 Broadway. 64

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Hardware and Iron.

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MCNEIL, J. C., Steam Boilers, Heavy Sheet Iron Work. Repairing promptly executed.

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MAY & FIEBEGER, Galvanized Iron Cornices. Send your plans for estimates. 62

Alliance, O.

MCFARLAND, J. W. Engine and Machine Builder, and General Machine Jobbing, 41

Buffalo, N. Y.

WHITE, L. & I, J. manf'r's of Coopers' Tools Carpenters' Tools, and Ship Tools. Also manf'r's of Planer Knives and Machine Cutters to order 310-314 Exchange street. 33

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ATLANTIC HOTEL, directly opposite the Railroad Depot. D. Foland, proprietor. W. Foland, H. W. Terrell, Clerks; Wm. Richardson, Night Clerk. 2

Canton, O.

NOVELTY IRON WORKS, Mill work, Shafting, engines, Imperial job printing press, etc. 73

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THE SUN VAPOR LIGHT & STOVE CO., manufacturers of Vapor Gas Lights, Gasoline Stoves and Tinner's Soldering Furnaces. Contractors for lighting the streets of cities and towns. No. 116 E. 5th Street 72

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CITY BOILER WORKS, manfrs of Stationary, Portable and Locomotive Steam Boilers. All work warranted Borger Bros. & Co. 03

ZELOTES WOOD & CO., manfrs of Malleable Iron. Cor. Randolph and West streets. 13

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THE CUYAHOGA FORGE AND IRON CO. manfrs. of every description Car, Truck & Driving Axles, Forging, Shafting, 71

Cincinnati, O

THE CINCINNATI STEAM HEATING CO. mfrs, dealers and contractors. Warming and Ventilation of public and private buildings a specialty. Boilers, Radiation, Pipe, Fittings, Brass Goods, &c. Correspondence solicited. 187 West Pearl street. 95

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LIMA HOUSE, centrally located; telegraph office in the house. J. Goldsmith, Prop.

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Niles, O.

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Business Directory.

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MYRICK BROS. & CO., manufact'rs Engines and Boilers, oil drilling tools, rig irons, etc. 73

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REID, JOS. Machinist, steam engine and pump repairing. Brass and iron castings, light and heavy, made on short notice. 2

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LAMBERT, GEORGE D. builder of Model and Special Machinery, Dies, Tools, Punches, etc. Wood and Metal Patterns. No, 27 Artisan Street. 54

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Rochester, N, Y.

GOWE, JNO. N., mfrs. of Specialties, such as Machine forging, bridge bolts and trusses, railroad switches, spike, mall, chisels, &c. 23

WOOD-WORKING MACHINERY. Send for Catalogue. J. S. Graham & Co. 48

Toledo, O.

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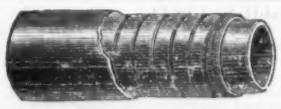

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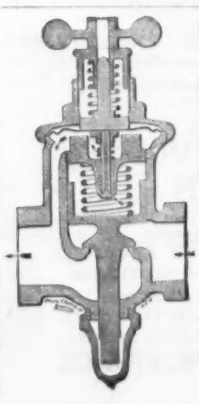

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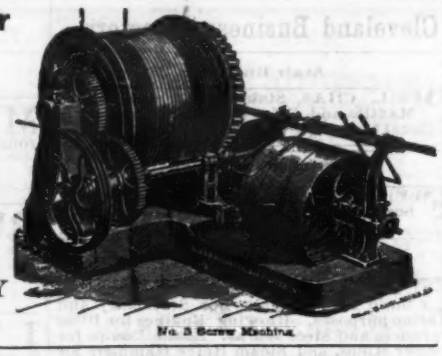
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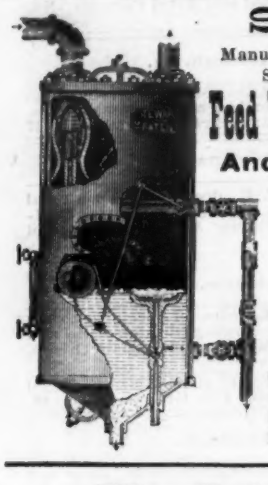

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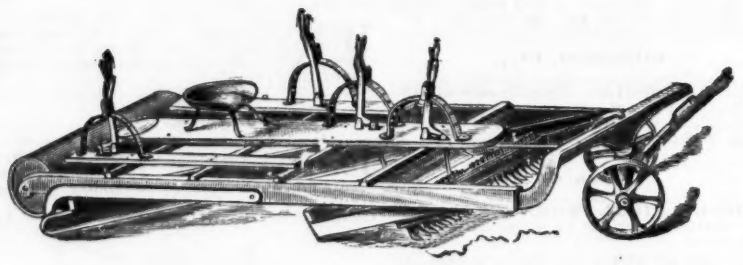

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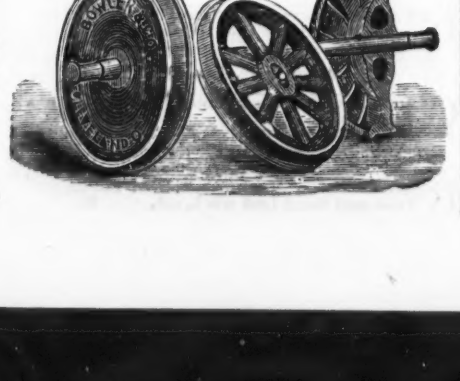

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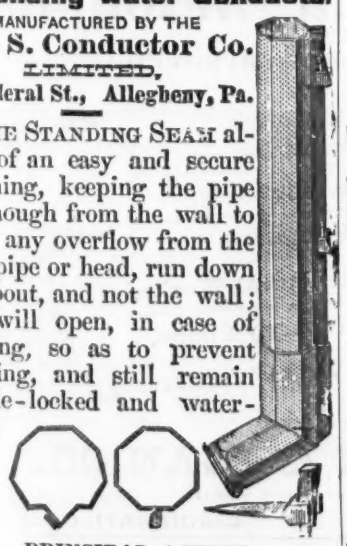

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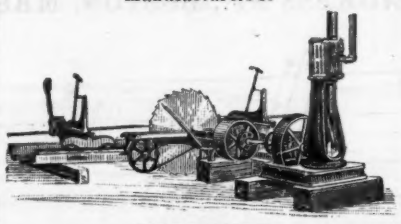

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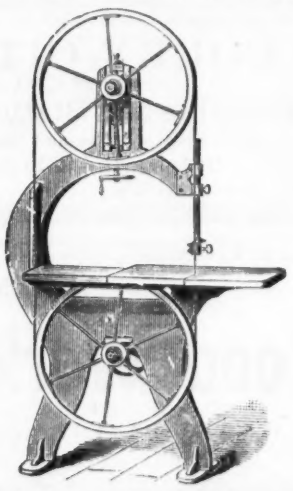

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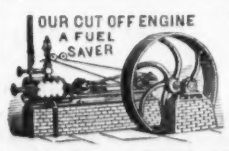

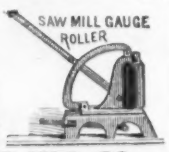

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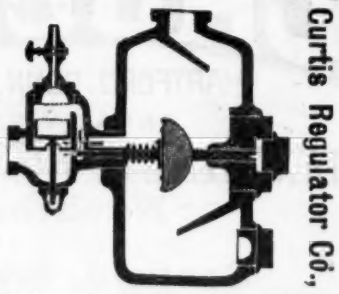

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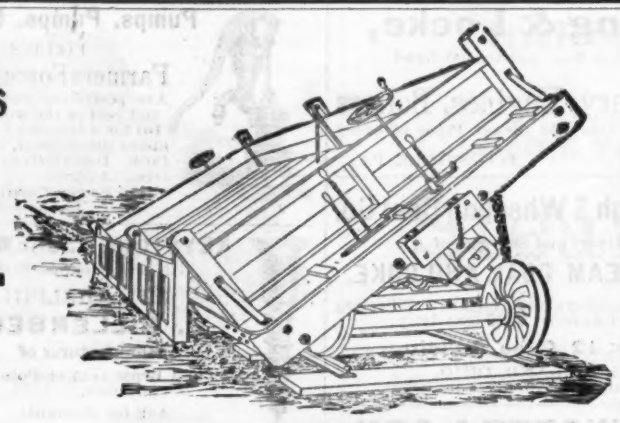

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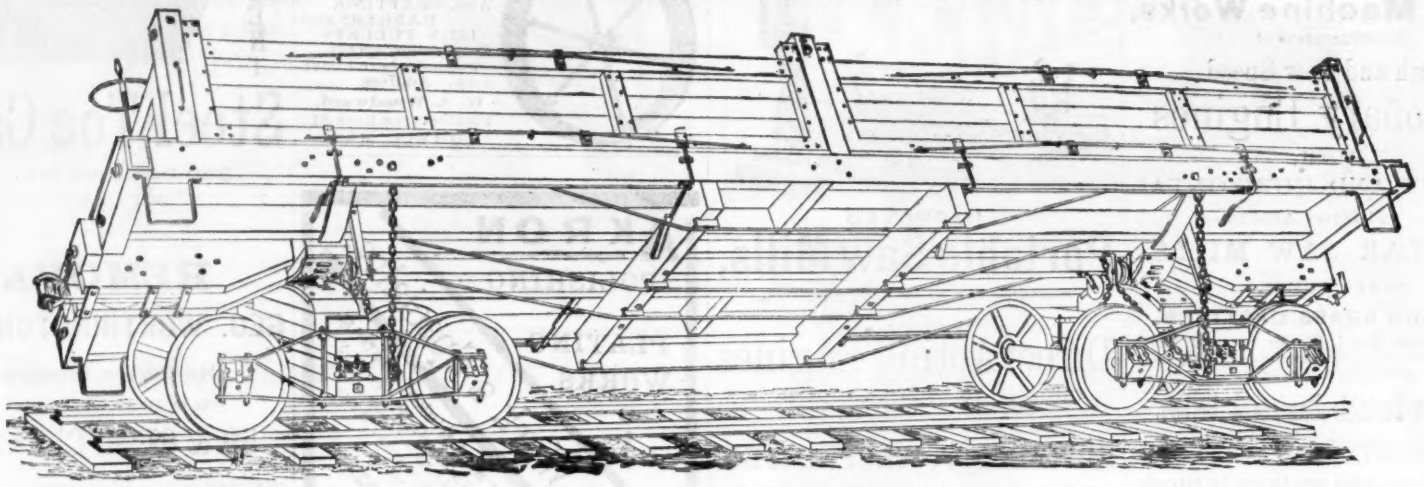

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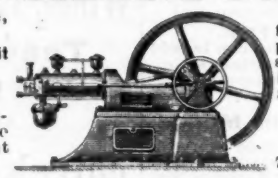

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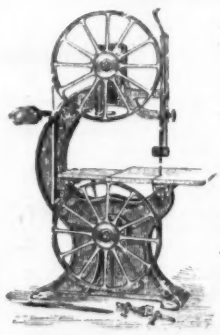

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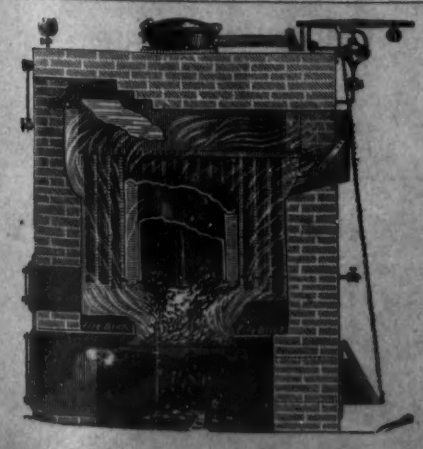

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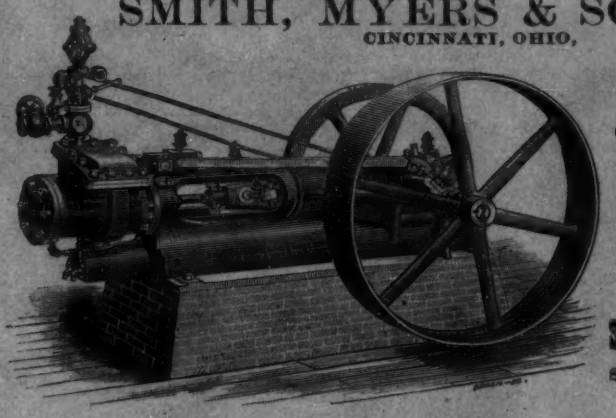

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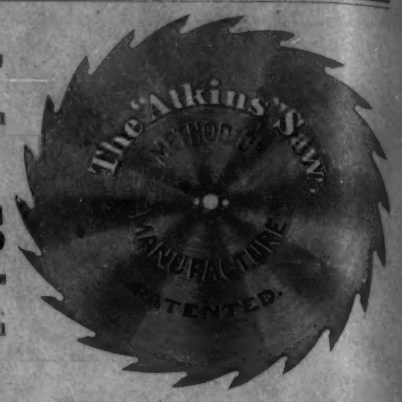

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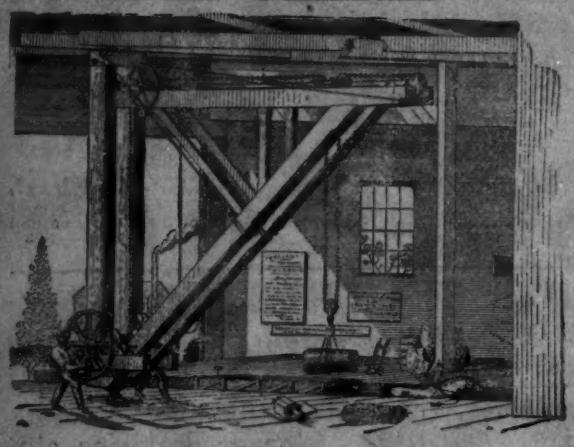

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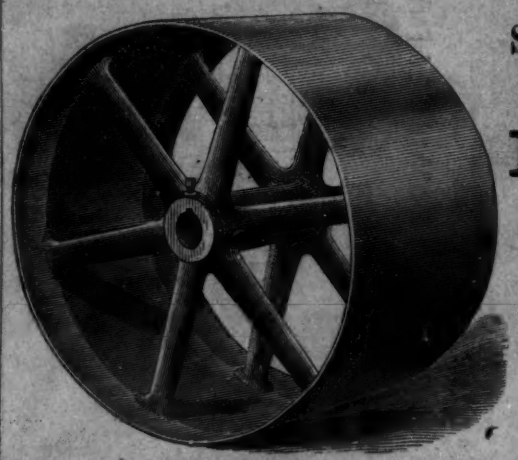

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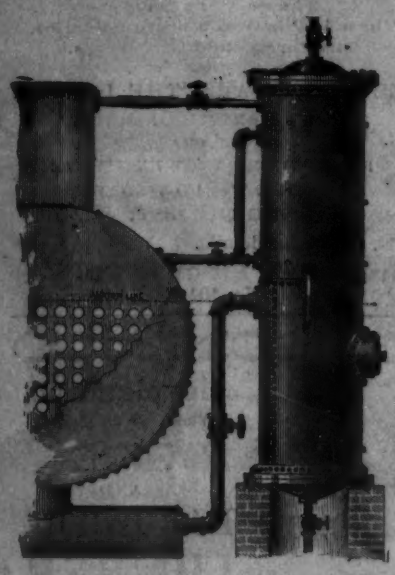

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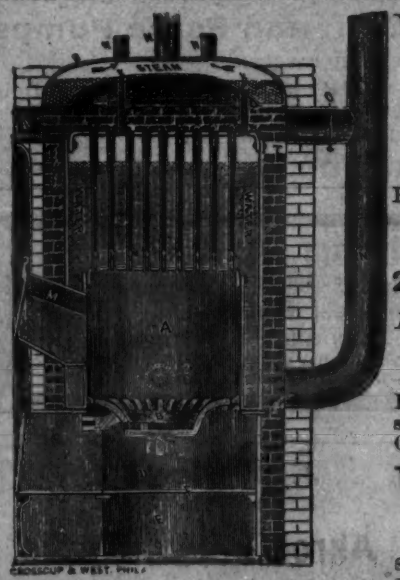

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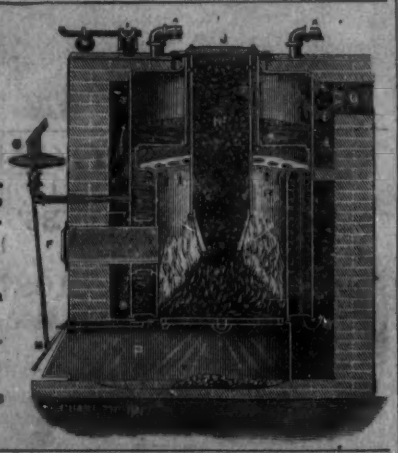

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